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Rock Eval™, Total Organic Carbon, Adsorption Isotherms and Organic Petrography of the Colorado Group: Shale Gas Data Release

Energy Resources Conservation Board

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Alberta Geological Survey

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Abstract

This report is a data release of adsorption isotherms, Rock Eval™, total organic carbon and organic petrography for selected samples of the Colorado Group generated for the ERCB/AGS project on shale gas resources in Alberta. This data release complements other reports and data from the same project, as listed in this report.

1 Introduction

ERCB/AGS initiated a project in 2007 to evaluate shale gas resources in Alberta, to determine the quantity and spatial extent of these resources. The first formations chosen for evaluation are the Colorado Group, and the Banff and Exshaw formations. Alberta Geological Survey is releasing a series of reports to disseminate data and knowledge from the project.

This report disseminates results from adsorption isotherms, Rock Eval™ and total organic carbon (TOC) analysis, and organic petrography associated with the Colorado Group. In addition to the analyses listed above, AGS ran a series of analyses on core and outcrop samples (Table 1). The data generated from the project will be combined with additional data to map and estimate shale gas resources in the province.

Table 1. Analyses performed on core and outcrop samples, and the organization that performed the analyses as part of the shale gas resource evaluation project.

Analysis Type	Company/Analyst	References
Adsorption isotherms	Schlumberger; CBM Solutions	Beaton et al. (2009), this report
Mercury porosimetry, envelope and helium pycnometry	Department of Physics, University of Alberta (D. Schmitt)	Pawlowicz et al. (2009a, b)
Permeametry	Department of Earth and Atmospheric Sciences, University of Alberta (M. Gingras)	Pawlowicz et al. (2009a, b)
Rock Eval™/TOC	Geological Survey of Canada; Schlumberger; CBM Solutions	Beaton et al. (2009), this report
Organic petrography	Geological Survey of Canada (J. Reyes)	Beaton et al. (2009), this report
Petrographic analysis (thin section)	Vancouver Petrographics; CBM Solutions	Work in progress
Scanning electron microscope with energy-dispersive X-ray	Department of Earth and Atmospheric Sciences, University of Alberta (G. Braybrook)	Pawlowicz et al. (2009a, b)
Environmental scanning electron microscope	Department of Biology, University of Alberta (R. Bhatnagar)	Pawlowicz et al. (2009a, b)
X-Ray diffraction (bulk and clay mineral)	SGS Minerals Services Ltd. (H. Zhou); CBM Solutions	Pawlowicz et al. (2009a, b)

Alberta Geological Survey is also releasing a series of reports to introduce the project and distribute information related to specific formations (Rokosh et al., 2009a–c).

2 Sample Location and Description

The location map (Figure 1) displays all core and outcrop sample sites associated with the Colorado Group. Tables 2 and 3, and Appendices 1 and 2 list the precise locations of the sample sites.

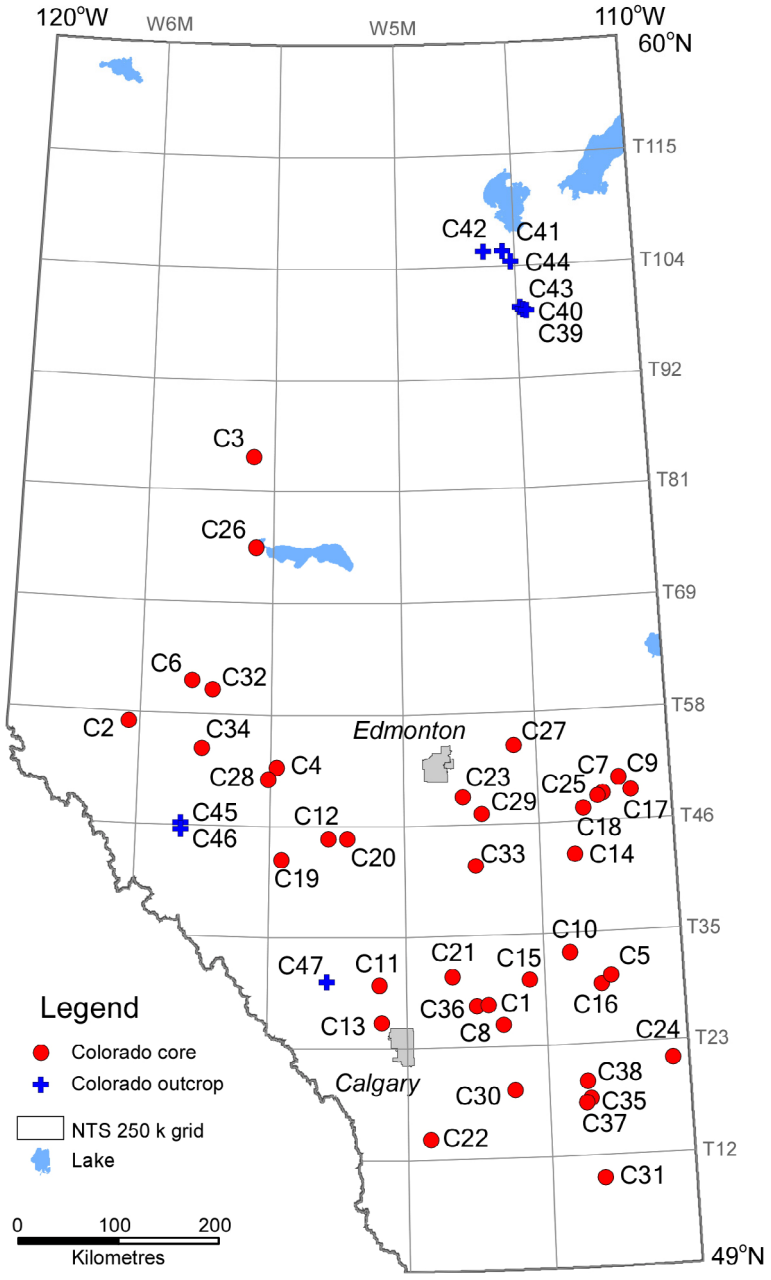

Figure 1. Core and outcrop sites sampled for the Colorado Group. See Appendices 1 to 4 for a list of all sites and the type and results of analyses run on various samples.

Table 2. Core sample sites in the Colorado Group.

Site No.	UWI	Year Drilled	Latitude (NAD 83)	Longitude (NAD 83)	Number of Samples
C1	100/04-11-028-22W4/00	2002	51.375375	-113.000008	6
C2	100/04-13-057-02W6/00	1962	53.921689	-118.170820	4
C3	100/04-29-084-15W5/00	1952	56.306578	-116.343026	6
C4	100/04-31-052-13W5/00	2002	53.530211	-115.912450	2
C5	100/05-03-030-09W4/00	1946	51.537185	-111.195974	4
C6	100/05-27-061-22W5/00	1997	54.301584	-117.223564	4
C7	100/05-30-049-07W4/00	2005	53.252575	-111.024184	2
C8	100/06-08-026-19W4/00	1980	51.202869	-112.626651	15
C9	100/06-11-051-06W4/00	2006	53.385074	-110.785026	2
C10	100/06-15-033-12W4/00	1980	51.827956	-111.624287	6
C11	100/06-17-030-03W5/00	1982	51.568032	-114.390518	8
C12	100/06-20-045-08W5/00	1979	52.892068	-115.129925	2
C13	100/06-21-026-03W5/00	1983	51.233282	-114.365538	6
C14	100/06-23-043-11W4/00	2004	52.716100	-111.492278	9
C15	100/06-29-030-16W4/00	1969	51.595232	-112.225252	5
C16	100/06-34-030-08W4/00	1969	51.609735	-111.052452	6
C17	100/06-36-049-05W4/00	2004	53.268414	-110.606135	3
C18	100/07-12-048-10W4/00	2004	53.124039	-111.332989	7
C19	100/07-16-043-13W5/00	2006	52.703957	-115.824531	3
C20	100/07-19-045-06W5/00	1979	52.892376	-114.854086	17
C21	100/08-09-031-24W4/00	1952	51.639466	-113.338692	2
C22	100/08-24-014-28W4/00	1998	50.184098	-113.687414	4
C23	100/08-27-049-22W4/00	2004	53.254932	-113.128424	5
C24	100/09-05-022-02W4/00	2004	50.844894	-110.240303	1
C25	100/09-16-049-08W4/00	2005	53.229437	-111.107643	6
C26	100/12-16-075-15W5/00	1950	55.499580	-116.274307	7
C27	100/12-32-054-16W4/00	2004	53.709217	-112.332670	9
C28	100/13-20-051-14W5/00	2003	53.421051	-116.035363	4
C29	100/13-34-047-20W4/00	2005	53.102456	-112.853120	4
C30	100/14-18-019-18W4/00	2004	50.612176	-112.488545	6
C31	100/15-03-010-10W4/00	1949	49.798867	-111.277656	3
C32	100/15-27-060-20W5/00	1982	54.221782	-116.911726	4
C33	100/16-21-042-21W4/00	1979	52.634805	-112.960210	10
C34	100/16-29-054-21W5/00	1980	53.697729	-117.053605	7
C35	102/03-14-018-11W4/00	2004	50.515815	-111.418557	4
C36	102/10-12-028-21W4/00	2004	51.381352	-112.830195	2
C37	102/11-32-017-11W4/00	2003	50.480518	-111.484881	8
C38	102/13-03-020-11W4/00	2004	50.670810	-111.457733	4

Table 3. Outcrop sample sites in the Colorado Group.

Site No.	UTM (NAD 83)			Site Location Name	No. of Samples	Formation/Group
	Zone	Easting	Northing			
C39	12	446778	6385401	Birch Mountains (NTS 84I)	1	Colorado
C40	12	449178	6384521	Birch Mountains (NTS 84I)	1	Colorado
C41	12	429162	6444821	Birch Mountains (NTS 84I)	1	Colorado
C42	12	410496	6444999	Birch Mountains (NTS 84I)	3	Colorado
C43	12	443512	6387776	Birch Mountains (Asphalt Creek)	16	Colorado - 2nd White Specks
44	12	436680	6434329	Birch Mountains (Greystone Creek)	22	Colorado - Shaftesbury
C45	11	478167	5875014	Cadomin (railroad section)	30	Colorado - Blackstone

3 Analytical Methods and Results

A total of 74 outcrop and 207 core samples was selected for analysis. The analyses itemized in Table 1 were performed on selected samples, as indicated in Appendices 3 and 4.

3.1 Isotherms, Rock Eval™/TOC

Adsorption isotherms, Rock Eval 6 and total organic carbon (TOC) analyses were performed on outcrop and core by Schlumberger/TerraTek and CBM Solutions, and Rock Eval 6, TOC and organic petrography by the Geological Survey of Canada. References for the methodology are, for isotherms, Bustin and Nassichuk (2002) and Mavor and Nelson (1997), and for Rock Eval and TOC, Lafargue et al. (1996).

Data are tabulated in Appendices 5a–c and 6. Adsorption isotherms indicate the gas storage capacity of the organic matter within a sample. Rock Eval indicates the current amount of hydrocarbon in a sample and the potential for *in situ* kerogen to generate hydrocarbon. Total organic carbon indicates total organic matter (suggestive of hydrocarbon potential); this dataset is useful in determining hydrocarbon potential of a sample.

3.2 Organic Petrography

Petrographic analysis of organic components (e.g., Taylor et al., 1998) of shale samples was performed to identify organic constituents conducive to hydrocarbon potential, texture and inorganic composition, and thermal maturity of the sample. Geological Survey of Canada–Calgary conducted the analyses (http://gsc.nrcan.gc.ca/labs/petrology_e.php [January 2009]). Data are tabulated in Appendix 7 and photomicrographs of organic constituents are presented in Appendix 8.

Organic petrography is typically performed in both white and UV-reflected light to observe dispersed organic matter and hydrocarbon in a sample. Organic petrography will help identify the type and amount of organic matter present (algae, bitumen, etc.) and is useful in determining hydrocarbon potential and modelling organic facies to assist in source-rock exploration and evaluation. Vitrinite reflectance (and reflectance on bitumen) is used to determine thermal maturation of a sample, which is correlated to its hydrocarbon-generation history and potential.

4 References

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Appendices

Appendix 1 – Colorado Group Core Sample Location, Depth and Lithology

Legend

Column Label	Label Description
Sample No.	AGS sample number
Site No.	Site location number
UWI	Well location - unique well identifier
Latitude (NAD 83)	Well location - degrees latitude (North American Datum 1983)
Longitude (NAD 83)	Well location - degrees longitude (North American Datum 1983)
Sample Depth (metres)	Depth of sample from core in metres (measured from core)
Lithology	Brief lithological description of sample
Formation Division	Subdivision of formation sampled
Year Sampled	Year sample collected

Sample No.	Site No.	UWI	Latitude (NAD 83)	Longitude (NAD 83)	Core Depth (metres)	Lithology	Formation Division	Year Sampled
8501	C01	100/04-11-028-22W4/00	51.375371	-113.000011	1230.3	Black shale	Belle Fourche	2007
8502	C01	100/04-11-028-22W4/00	51.375371	-113.000011	1238.1	Black shale	Belle Fourche	2007
8503	C01	100/04-11-028-22W4/00	51.375371	-113.000011	1245.0	Black shale	Belle Fourche	2007
8504	C01	100/04-11-028-22W4/00	51.375371	-113.000011	1248.5	Black shale	Belle Fourche	2007
8505	C01	100/04-11-028-22W4/00	51.375371	-113.000011	1249.7	Black shale with very fine sandstone interbedded	Fish Scale Zone	2007
8506	C01	100/04-11-028-22W4/00	51.375371	-113.000011	1252.5	Black shale	Fish Scale Zone	2007
8668	C02	100/04-13-057-02W6/00	53.921709	-118.170803	2582.3	Black mudstone	Cardium Zone	2007
8669	C02	100/04-13-057-02W6/00	53.921709	-118.170803	2589.1	Black mudstone	Cardium Zone	2007
8670	C02	100/04-13-057-02W6/00	53.921709	-118.170803	2592.5	Black shale	Cardium Zone	2007
8671	C02	100/04-13-057-02W6/00	53.921709	-118.170803	2593.8	Dark grey silty mudstone with coaly detritus	Cardium Zone	2007
8627	C03	100/04-29-084-15W5/00	56.306578	-116.343167	292.6	Grey mudstone	Westgate	2007
8628	C03	100/04-29-084-15W5/00	56.306578	-116.343167	298.4	Dark grey mudstone	Westgate	2007
8629	C03	100/04-29-084-15W5/00	56.306578	-116.343167	300.5	Dark grey mudstone	Westgate	2007
8630	C03	100/04-29-084-15W5/00	56.306578	-116.343167	308.5	Grey mudstone	Westgate	2007
8631	C03	100/04-29-084-15W5/00	56.306578	-116.343167	314.6	Dark grey mudstone	Westgate	2007
8632	C03	100/04-29-084-15W5/00	56.306578	-116.343167	320.0	Grey mudstone	Westgate	2007
8034	C04	100/04-31-052-13W5/00	53.530131	-115.912450	1808.9-1809.5	Dark grey shale	Second White Specks	2008
8035	C04	100/04-31-052-13W5/00	53.530131	-115.912450	1818.4	Dark grey shale	Second White Specks	2008
8531	C05	100/05-03-030-09W4/00	51.537186	-111.196063	554.7	Grey mudstone with fossils	First White Specks?	2007
8532	C05	100/05-03-030-09W4/00	51.537186	-111.196063	559.6	Grey mudstone with fossils	First White Specks?	2007
8533	C05	100/05-03-030-09W4/00	51.537186	-111.196063	560.2	Grey mudstone with fossils	First White Specks?	2007
8534	C05	100/05-03-030-09W4/00	51.537186	-111.196063	565.1	Grey speckled mudstone	First White Specks?	2007
8644	C06	100/05-27-061-22W5/00	54.301586	-117.223691	1852.8	Dark grey shale	Shaftesbury	2007
8645	C06	100/05-27-061-22W5/00	54.301586	-117.223691	1854.4	Dark grey mudstone	Shaftesbury	2007
8646	C06	100/05-27-061-22W5/00	54.301586	-117.223691	1857.0	Black coaly shale?	Shaftesbury	2007
8647	C06	100/05-27-061-22W5/00	54.301586	-117.223691	1860.5	Black shale	Shaftesbury	2007
8540	C07	100/05-30-049-07W4/00	53.252497	-111.024094	428.8	Grey siltstone	Card. Equiv. Zone	2007
8541	C07	100/05-30-049-07W4/00	53.252497	-111.024094	432.3	Grey siltstone	Card. Equiv. Zone	2007
8581	C08	100/06-08-026-19W4/00	51.202794	-112.626775	811.5	Black shale	Milk River	2007
8582	C08	100/06-08-026-19W4/00	51.202794	-112.626775	813.8	Dark grey shale	Milk River	2007
8583	C08	100/06-08-026-19W4/00	51.202794	-112.626775	818.0	Dark grey shale	First White Specks	2007
8584	C08	100/06-08-026-19W4/00	51.202794	-112.626775	822.4	Shaley siltstone laminated	First White Specks	2007
8585	C08	100/06-08-026-19W4/00	51.202794	-112.626775	823.0	Interbedded mudstone and siltstone	First White Specks	2007
8586	C08	100/06-08-026-19W4/00	51.202794	-112.626775	825.0	Dark grey shale	First White Specks	2007
8587	C08	100/06-08-026-19W4/00	51.202794	-112.626775	828.5	Grey siltstone	First White Specks	2007
8588	C08	100/06-08-026-19W4/00	51.202794	-112.626775	832.4	Dark grey mudstone	First White Specks	2007
8589	C08	100/06-08-026-19W4/00	51.202794	-112.626775	833.7	Dark grey shale	First White Specks	2007
8590	C08	100/06-08-026-19W4/00	51.202794	-112.626775	836.1	Dark grey silty shale	First White Specks	2007
8591	C08	100/06-08-026-19W4/00	51.202794	-112.626775	841.4	Dark grey shale	First White Specks	2007
8592	C08	100/06-08-026-19W4/00	51.202794	-112.626775	847.8	Dark grey shale	Medicine Hat	2007
8593	C08	100/06-08-026-19W4/00	51.202794	-112.626775	850.4	Dark grey shale	Medicine Hat	2007
8594	C08	100/06-08-026-19W4/00	51.202794	-112.626775	853.7	Black shale	Medicine Hat	2007
8595	C08	100/06-08-026-19W4/00	51.202794	-112.626775	856.2	Dark grey shale	Medicine Hat	2007
8529	C09	100/06-11-051-06W4/00	53.385156	-110.785097	332.6	Grey siltstone	Card. Equiv. Zone	2007

Sample No.	Site No.	UWI	Latitude (NAD 83)	Longitude (NAD 83)	Core Depth (metres)	Lithology	Formation Division	Year Sampled
8530	C09	100/06-11-051-06W4/00	53.385156	-110.785097	333.4	Grey siltstone	Card. Equiv. Zone	2007
8575	C10	100/06-15-033-12W4/00	51.827959	-111.624249	799.6	Black shale	Card. Equiv. Zone	2007
8576	C10	100/06-15-033-12W4/00	51.827959	-111.624249	800.7	Black shale interbedded with siltstone	Card. Equiv. Zone	2007
8577	C10	100/06-15-033-12W4/00	51.827959	-111.624249	806.6	Dark grey speckled shale	Second White Specks	2007
8578	C10	100/06-15-033-12W4/00	51.827959	-111.624249	809.8	Dark grey shale	Second White Specks	2007
8579	C10	100/06-15-033-12W4/00	51.827959	-111.624249	814.1	Dark grey speckled shale	Second White Specks	2007
8580	C10	100/06-15-033-12W4/00	51.827959	-111.624249	816.3	Dark grey shale	Second White Specks	2007
8042	C11	100/06-17-030-03W5/00	51.568035	-114.390524	2319.7-2328.9	Combined samples: 8606, 07, 08, 09	Fish Scale Zone	2007
8606	C11	100/06-17-030-03W5/00	51.568035	-114.390524	2319.7	Black laminated shale	Fish Scale Zone	2007
8607	C11	100/06-17-030-03W5/00	51.568035	-114.390524	2323.5	Black laminated shale	Fish Scale Zone	2007
8608	C11	100/06-17-030-03W5/00	51.568035	-114.390524	2326.0	Black shale	Fish Scale Zone	2007
8609	C11	100/06-17-030-03W5/00	51.568035	-114.390524	2328.9	Black shale	Fish Scale Zone	2007
8610	C11	100/06-17-030-03W5/00	51.568035	-114.390524	2330.2	Black shale	Westgate	2007
8611	C11	100/06-17-030-03W5/00	51.568035	-114.390524	2333.0	Black shale	Westgate	2007
8612	C11	100/06-17-030-03W5/00	51.568035	-114.390524	2336.3	Black laminated shale	Westgate	2007
8613	C12	100/06-20-045-08W5/00	52.892068	-115.129927	1772.4	Black shale	Blackstone	2007
8614	C12	100/06-20-045-08W5/00	52.892068	-115.129927	1773.6	Black shale	Blackstone	2007
8507	C13	100/06-21-026-03W5/00	51.233362	-114.365477	2239.5	Black shaley mudstone	First White Specks	2007
8508	C13	100/06-21-026-03W5/00	51.233362	-114.365477	2241.5	Black shaley mudstone	First White Specks	2007
8509	C13	100/06-21-026-03W5/00	51.233362	-114.365477	2249.0	Black mudstone with very fine sandstone lenses	Cardium Zone	2007
8510	C13	100/06-21-026-03W5/00	51.233362	-114.365477	2256.3	Dark grey silty mudstone	Cardium Zone	2007
8511	C13	100/06-21-026-03W5/00	51.233362	-114.365477	2264.3	Dark grey mudstone	Cardium Zone	2007
8512	C13	100/06-21-026-03W5/00	51.233362	-114.365477	2279.8	Dark grey mudstone	Cardium Zone	2007
8041	C14	100/06-23-043-11W4/00	52.716098	-111.492145	548.9-560.4	Combined samples: 8523, 24, 25, 27, 28	Second White Specks	2007
8521	C14	100/06-23-043-11W4/00	52.716098	-111.492145	542.9	Black shale	top of Second White Specks	2007
8522	C14	100/06-23-043-11W4/00	52.716098	-111.492145	546.2	Interbedded silt, shale, very fine sandstone	Second White Specks	2007
8523	C14	100/06-23-043-11W4/00	52.716098	-111.492145	548.9	Silty shale	Second White Specks	2007
8524	C14	100/06-23-043-11W4/00	52.716098	-111.492145	550.4	Silty shale	Second White Specks	2007
8525	C14	100/06-23-043-11W4/00	52.716098	-111.492145	553.4	Muddy siltstone with very fine sandstone lenses	Second White Specks	2007
8526	C14	100/06-23-043-11W4/00	52.716098	-111.492145	555.5	Muddy siltstone with very fine sandstone lenses	Second White Specks	2007
8527	C14	100/06-23-043-11W4/00	52.716098	-111.492145	557.2	Dark grey shale	Second White Specks	2007
8528	C14	100/06-23-043-11W4/00	52.716098	-111.492145	560.4	Laminated muddy siltstone and very fine sandstone	Second White Specks	2007
8535	C15	100/06-29-030-16W4/00	51.595231	-112.225340	1060.7	Black shale	Fish Scale Zone	2007
8536	C15	100/06-29-030-16W4/00	51.595231	-112.225340	1062.2	Black shale	Fish Scale Zone	2007
8537	C15	100/06-29-030-16W4/00	51.595231	-112.225340	1064.1	Black shale and siltstone with fossils	Fish Scale Zone	2007
8538	C15	100/06-29-030-16W4/00	51.595231	-112.225340	1069.5	Dark grey shale	Fish Scale Zone	2007
8539	C15	100/06-29-030-16W4/00	51.595231	-112.225340	1077.9	Dark grey shale	Westgate	2007
8556	C16	100/06-34-030-08W4/00	51.609735	-111.052456	647.7	Dark grey mudstone	First White Specks	2007
8557	C16	100/06-34-030-08W4/00	51.609735	-111.052456	656.2	Grey mudstone	Card. Equiv. Zone?	2007
8558	C16	100/06-34-030-08W4/00	51.609735	-111.052456	662.3	Grey mudstone	Card. Equiv. Zone?	2007
8559	C16	100/06-34-030-08W4/00	51.609735	-111.052456	673.5	Grey shale with fossils	Card. Equiv. Zone?	2007
8560	C16	100/06-34-030-08W4/00	51.609735	-111.052456	680.5	Dark grey mudstone	Card. Equiv. Zone?	2007
8561	C16	100/06-34-030-08W4/00	51.609735	-111.052456	687.0	Dark grey mudstone	Card. Equiv. Zone?	2007
8542	C17	100/06-36-049-05W4/00	53.268492	-110.606221	410.0	Grey silty shale	Card. Equiv. Zone	2007

Sample No.	Site No.	UWI	Latitude (NAD 83)	Longitude (NAD 83)	Core Depth (metres)	Lithology	Formation Division	Year Sampled
8543	C17	100/06-36-049-05W4/00	53.268492	-110.606221	414.0	Grey siltstone	Card. Equiv. Zone	2007
8544	C17	100/06-36-049-05W4/00	53.268492	-110.606221	417.5	Dark grey shale with silty laminea	Card. Equiv. Zone	2007
7294	C18	100/07-12-048-10W4/00	53.124039	-111.332969	498.7	Shale	Cardium Zone	2006
7295	C18	100/07-12-048-10W4/00	53.124039	-111.332969	504.4	Shale	Cardium Zone	2006
7296	C18	100/07-12-048-10W4/00	53.124039	-111.332969	507.1	Shale	Cardium Zone	2006
7297	C18	100/07-12-048-10W4/00	53.124039	-111.332969	507.7	Shale	Cardium Zone	2006
7298	C18	100/07-12-048-10W4/00	53.124039	-111.332969	508.2	Shale	Cardium Zone	2006
7299	C18	100/07-12-048-10W4/00	53.124039	-111.332969	512.1	Shale	Cardium Zone	2006
7300	C18	100/07-12-048-10W4/00	53.124039	-111.332969	519.4	Shale	Cardium Zone	2006
8641	C19	100/07-16-043-13W5/00	52.703956	-115.824539	2916.6-2932	Black shale	Westgate	2007
8642	C19	100/07-16-043-13W5/00	52.703956	-115.824539	2916.6-2932	Black shale	Westgate	2007
8643	C19	100/07-16-043-13W5/00	52.703956	-115.824539	2916.6-2932	Black shale	Westgate	2007
8045	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1816.6-1821.9	Combined samples: 8650, 51, 52	Second White Specks	2007
8648	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1810.9	Black mudstone	Second White Specks	2007
8649	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1814.3	Black mudstone	Second White Specks	2007
8650	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1816.6	Black mudstone	Second White Specks	2007
8651	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1819.8	Black mudstone	Second White Specks	2007
8652	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1821.9	Black mudstone	Second White Specks	2007
8653	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1825.3	Dark grey shale	Second White Specks	2007
8654	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1827.6	Dark grey shale	Second White Specks	2007
8655	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1832.8	Black mudstone	Second White Specks	2007
8656	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1836.1	Dark grey mudstone	Second White Specks	2007
8657	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1840.1	Black mudstone	Second White Specks	2007
8658	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1846.8	Black mudstone	Second White Specks	2007
8659	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1852.0	Black mudstone	Second White Specks	2007
8660	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1856.0	Black mudstone	Belle Fourche?	2007
8661	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1859.8	Black shale	Belle Fourche?	2007
8662	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1865.2	Black mudstone	Belle Fourche?	2007
8663	C20	100/07-19-045-06W5/00	52.892373	-114.854086	1869.6	Black mudstone	Belle Fourche?	2007
8554	C21	100/08-09-031-24W4/00	51.639470	-113.338736	1448.6	Black shale	Westgate	2007
8555	C21	100/08-09-031-24W4/00	51.639470	-113.338736	1449.0	Black shale	Westgate	2007
7289	C22	100/08-24-014-28W4/00	50.184105	-113.687534	2104.0	Shale	Fish Scale Zone	2006
7290	C22	100/08-24-014-28W4/00	50.184105	-113.687534	2112.1	Shale	Fish Scale Zone	2006
7291	C22	100/08-24-014-28W4/00	50.184105	-113.687534	2117.4	Shale	Fish Scale Zone	2006
7292	C22	100/08-24-014-28W4/00	50.184105	-113.687534	2120.0	Shale	Fish Scale Zone	2006
8048	C23	100/08-27-049-22W4/00	53.254931	-113.128424	745.0-747.5	Combined samples: 8666, 67	First White Specks	2007
8664	C23	100/08-27-049-22W4/00	53.254931	-113.128424	738.3	Dark grey shale	First White Specks	2007
8665	C23	100/08-27-049-22W4/00	53.254931	-113.128424	742.5	Dark grey shale	First White Specks	2007
8666	C23	100/08-27-049-22W4/00	53.254931	-113.128424	745.0	Dark grey shale	First White Specks	2007
8667	C23	100/08-27-049-22W4/00	53.254931	-113.128424	747.5	Dark grey shale	First White Specks	2007
8029	C24	100/09-05-022-02W4/00	50.844880	-110.240286	622.0-622.4	Shale	Fish Scale Zone	2008
8548	C25	100/09-16-049-08W4/00	53.229438	-111.107681	447.9	Dark grey shale	First White Specks	2007
8549	C25	100/09-16-049-08W4/00	53.229438	-111.107681	450.0	Grey interbedded silt and shale	Card. Equiv. Zone	2007
8550	C25	100/09-16-049-08W4/00	53.229438	-111.107681	455.4	Dark grey silty shale	Card. Equiv. Zone	2007

Sample No.	Site No.	UWI	Latitude (NAD 83)	Longitude (NAD 83)	Core Depth (metres)	Lithology	Formation Division	Year Sampled
8551	C25	100/09-16-049-08W4/00	53.229438	-111.107681	457.7	Dark grey silty shale	Card. Equiv. Zone	2007
8552	C25	100/09-16-049-08W4/00	53.229438	-111.107681	462.5	Grey siltstone	Card. Equiv. Zone	2007
8553	C25	100/09-16-049-08W4/00	53.229438	-111.107681	470.2	Grey shaley siltstone	Card. Equiv. Zone	2007
8620	C26	100/12-16-075-15W5/00	55.499583	-116.274312	211.1	Dark grey silty shale	1stWS or Card. Equiv	2007
8621	C26	100/12-16-075-15W5/00	55.499583	-116.274312	216.1	Grey silty shale	1stWS or Card. Equiv	2007
8622	C26	100/12-16-075-15W5/00	55.499583	-116.274312	240.5	Grey silty shale	Second White Specks?	2007
8623	C26	100/12-16-075-15W5/00	55.499583	-116.274312	245.4	Grey silty shale	Second White Specks?	2007
8624	C26	100/12-16-075-15W5/00	55.499583	-116.274312	271.0	Grey silty shale	Second White Specks?	2007
8625	C26	100/12-16-075-15W5/00	55.499583	-116.274312	275.2	Grey silty shale	Second White Specks?	2007
8626	C26	100/12-16-075-15W5/00	55.499583	-116.274312	280.7	Grey silty shale	Second White Specks?	2007
8566	C27	100/12-32-054-16W4/00	53.709219	-112.332668	417.3	Silty shale	First White Specks	2007
8567	C27	100/12-32-054-16W4/00	53.709219	-112.332668	420.5	Dark grey shale	First White Specks	2007
8568	C27	100/12-32-054-16W4/00	53.709219	-112.332668	423.0	Dark grey shale	First White Specks	2007
8569	C27	100/12-32-054-16W4/00	53.709219	-112.332668	425.5	Dark grey shale	First White Specks	2007
8570	C27	100/12-32-054-16W4/00	53.709219	-112.332668	459.0	Dark grey shale	First White Specks	2007
8571	C27	100/12-32-054-16W4/00	53.709219	-112.332668	461.3	Grey shale	Card. Equiv. Zone	2007
8572	C27	100/12-32-054-16W4/00	53.709219	-112.332668	464.0	Grey shale	Card. Equiv. Zone	2007
8573	C27	100/12-32-054-16W4/00	53.709219	-112.332668	466.6	Grey mudstone	Card. Equiv. Zone	2007
8574	C27	100/12-32-054-16W4/00	53.709219	-112.332668	471.2	Grey siltstone	Card. Equiv. Zone	2007
8637	C28	100/13-20-051-14W5/00	53.421052	-116.035361	2017.5	Black mudstone	Second White Specks	2007
8638	C28	100/13-20-051-14W5/00	53.421052	-116.035361	2021.8	Black mudstone	Second White Specks	2007
8639	C28	100/13-20-051-14W5/00	53.421052	-116.035361	2071.5	Black shale	Second White Specks	2007
8640	C28	100/13-20-051-14W5/00	53.421052	-116.035361	2078.0	Black shale	Second White Specks	2007
8562	C29	100/13-34-047-20W4/00	53.102458	-112.853229	844.5	Dark grey muddy siltstone	Card. Equiv. Zone	2007
8563	C29	100/13-34-047-20W4/00	53.102458	-112.853229	864.5	Dark grey muddy siltstone	Card. Equiv. Zone	2007
8564	C29	100/13-34-047-20W4/00	53.102458	-112.853229	849.0	Grey siltstone with sandstone laminea	Second White Specks	2007
8565	C29	100/13-34-047-20W4/00	53.102458	-112.853229	852.4	Grey siltstone with sandstone laminea	Second White Specks	2007
8023	C30	100/14-18-019-18W4/00	50.612334	-112.488539	608.8-609.35	Grey mudstone	First White Specks	2008
8024	C30	100/14-18-019-18W4/00	50.612334	-112.488539	622.7-623.25	Grey mudstone	First White Specks	2008
8513	C30	100/14-18-019-18W4/00	50.612334	-112.488539	605.5	Dark grey mudstone	Milk River	2007
8514	C30	100/14-18-019-18W4/00	50.612334	-112.488539	612.0	Grey mudstone with fossils	Milk River	2007
8515	C30	100/14-18-019-18W4/00	50.612334	-112.488539	616.2	Grey shaley mudstone	First White Specks	2007
8516	C30	100/14-18-019-18W4/00	50.612334	-112.488539	630.0	Grey shale with fossils	First White Specks	2007
8545	C31	100/15-03-010-10W4/00	49.798865	-111.277533	381.3	Dark grey silty shale with fossils	First White Specks?	2007
8546	C31	100/15-03-010-10W4/00	49.798865	-111.277533	711.7	Dark grey silty shale	Westgate	2007
8547	C31	100/15-03-010-10W4/00	49.798865	-111.277533	715.1	Dark grey silty shale	Westgate	2007
8633	C32	100/15-27-060-20W5/00	54.221784	-116.911727	1732.4	Dark grey shale	Second White Specks	2007
8634	C32	100/15-27-060-20W5/00	54.221784	-116.911727	1740.2	Dark grey shale	Second White Specks	2007
8635	C32	100/15-27-060-20W5/00	54.221784	-116.911727	1745.4	Dark grey shale	Second White Specks	2007
8636	C32	100/15-27-060-20W5/00	54.221784	-116.911727	1755.0	Dark grey shale	Second White Specks	2007
8596	C33	100/16-21-042-21W4/00	52.634819	-112.960441	805.1	Dark grey shale	Milk River	2007
8597	C33	100/16-21-042-21W4/00	52.634819	-112.960441	808.4	Dark grey shale with fossils	Milk River	2007
8598	C33	100/16-21-042-21W4/00	52.634819	-112.960441	811.5	Dark grey shale	First White Specks	2007
8599	C33	100/16-21-042-21W4/00	52.634819	-112.960441	814.6	Laminated siltstone and shale	First White Specks	2007

Sample No.	Site No.	UWI	Latitude (NAD 83)	Longitude (NAD 83)	Core Depth (metres)	Lithology	Formation Division	Year Sampled
8600	C33	100/16-21-042-21W4/00	52.634819	-112.960441	817.9	Dark grey mudstone	First White Specks	2007
8601	C33	100/16-21-042-21W4/00	52.634819	-112.960441	1029.1	Black shale	Card. Equiv. Zone	2007
8602	C33	100/16-21-042-21W4/00	52.634819	-112.960441	1032.1	Dark grey laminated mudstone	Card. Equiv. Zone	2007
8603	C33	100/16-21-042-21W4/00	52.634819	-112.960441	1035.3	Shale with interbedded siltstone/sandstone	Second White Specks	2007
8604	C33	100/16-21-042-21W4/00	52.634819	-112.960441	1042.5	Black shale and very fine sandstone interbedded	Second White Specks	2007
8605	C33	100/16-21-042-21W4/00	52.634819	-112.960441	1043.8	Dark grey shale with interbedded siltstone	Second White Specks	2007
8043	C34	100/16-29-054-21W5/00	53.697805	-117.053719	2319.1-2323.7	Combined samples: 8615, 16	Blackstone	2007
8044	C34	100/16-29-054-21W5/00	53.697805	-117.053719	2480.0-2498	Combined samples: 8618, 19	Belle Fourche?	2007
8615	C34	100/16-29-054-21W5/00	53.697805	-117.053719	2319.1	Black mudstone	Blackstone	2007
8616	C34	100/16-29-054-21W5/00	53.697805	-117.053719	2323.7	Black mudstone	Blackstone	2007
8617	C34	100/16-29-054-21W5/00	53.697805	-117.053719	2325.4	Black mudstone	Blackstone	2007
8618	C34	100/16-29-054-21W5/00	53.697805	-117.053719	2480.0-2498	Black mudstone	Belle Fourche?	2007
8619	C34	100/16-29-054-21W5/00	53.697805	-117.053719	2480.0-2498	Black mudstone	Belle Fourche?	2007
8517	C35	102/03-14-018-11W4/00	50.515811	-111.418574	400.0	Dark grey speckled shale	First White Specks	2007
8518	C35	102/03-14-018-11W4/00	50.515811	-111.418574	407.5	Dark grey shale and very fine sandstone with fossils	First White Specks	2007
8519	C35	102/03-14-018-11W4/00	50.515811	-111.418574	410.1	Dark grey silty shale with fossils	First White Specks	2007
8520	C35	102/03-14-018-11W4/00	50.515811	-111.418574	417.8	Black mudstone with fossils	1stWS or just below	2007
8036	C36	102/10-12-028-21W4/00	51.381280	-112.830199	1075-1075.75	Dark grey shale	Second White Specks	2008
8037	C36	102/10-12-028-21W4/00	51.381280	-112.830199	1089.3-1090	Dark grey shale	Second White Specks	2008
6901	C37	102/11-32-017-11W4/00	50.480595	-111.484723	661.6	Shale	Second White Specks	2006
6902	C37	102/11-32-017-11W4/00	50.480595	-111.484723	669.8	Shale	Second White Specks	2006
6903	C37	102/11-32-017-11W4/00	50.480595	-111.484723	670.3	Shale	Second White Specks	2006
6904	C37	102/11-32-017-11W4/00	50.480595	-111.484723	671.2	Shale	Second White Specks	2006
6905	C37	102/11-32-017-11W4/00	50.480595	-111.484723	675.9	Shale	Second White Specks	2006
6906	C37	102/11-32-017-11W4/00	50.480595	-111.484723	677.0	Shale	Second White Specks	2006
8032	C37	102/11-32-017-11W4/00	50.480595	-111.484723	664.5-665	Shale	Second White Specks	2008
8033	C37	102/11-32-017-11W4/00	50.480595	-111.484723	677.3-678.8	Shale	Second White Specks	2008
8025	C38	102/13-03-020-11W4/00	50.670811	-111.457734	452.9-453.3	Grey shale	First White Specks	2008
8026	C38	102/13-03-020-11W4/00	50.670811	-111.457734	666.2-666.7	Grey shale	Base 1stWS	2008
8027	C38	102/13-03-020-11W4/00	50.670811	-111.457734	701.6-702.15	Grey shale	Second White Specks	2008
8028	C38	102/13-03-020-11W4/00	50.670811	-111.457734	709.9-710.45	Dark grey shale	Second White Specks	2008
6916	Duplicate	Duplicate of 7291	50.184105	-113.687534	2112.1	Shale	Fish Scale Zone	2006
8672	Duplicate	Duplicate of 8502	51.375371	-113.000011		Black shale	Belle Fourche	2007
8673	Duplicate	Duplicate of 8507	51.233362	-114.365477		Black shaley mudstone	First White Specks	2007
8674	Duplicate	Duplicate of 8604	52.634819	-112.960441		Black shale and very fine sandstone interbedded	Second White Specks	2007
8675	Duplicate	Duplicate of 8562	53.102458	-112.853229		Dark grey muddy siltstone	Card. Equiv. Zone	2007
8676	Duplicate	Duplicate of 8593	51.202794	-112.626775		Dark grey shale	Medicine Hat?	2007
8677	Duplicate	Duplicate of 8645	54.301586	-117.223691		Dark grey mudstone	Shaftesbury	2007
8030	Resample	Resample of 8639	53.421052	-116.035361	2071.5	Black shale	Second White Specks	2008
8031	Resample	Resample of 8637	53.421052	-116.035361	2017.5	Black mudstone	Second White Specks	2008

Appendix 2 – Colorado Group Outcrop Sample Location, Depth and Lithology

Column Label	Label Description
Sample No.	AGS sample number
Site No.	Site location number
Site Location	Description of outcrop site
Zone	Site location - UTM Zone
Easting	Site location - UTM easting
Northing	Site location - UTM northing
Elevation (metres ASL)	Elevation of sampled site in metres above sea level
Lithology	Brief lithological description of sample
Formation or Group	Geological formation or group at depth of sample
Formation Division	Subdivision of formation sampled
Sample Depth and	Sample location on section

Sample No.	Site No.	Site Location	Year	UTM (NAD 83)			Elevation (metres ASL)	Lithology	Formation or Group	Formation Division	Sample Depth and Description
				Zone	Easting	Northing					
5746	C39	Birch Mtns - NTS 84I	2007	12	446778	6385401	536	Shale	Colorado	Fish Scale Zone	Colorado shales
5747	C40	Birch Mtns - NTS 84I	2007	12	449178	6384521	512	Shale	Colorado	Westgate	30 cm above Pelican contact
5748	C41	Birch Mtns - NTS 84I	2007	12	429162	6444821	480	Shale	Grand Rapids	Grand Rapids	Colorado shales
6825	C42	Birch Mtns - NTS 84I	2007	12	410496	6444999	530.3	Shale	Colorado	Westgate Fm	1 m above Pelican contact
6826	C42	Birch Mtns - NTS 84I	2007	12	410479	6445015	545.7	Shale	Colorado	Westgate Fm	30 cm below Base Fish Scales Zone
6827	C42	Birch Mtns - NTS 84I	2007	12	410479	6445019	546	Shale	Colorado	Fish Scale Zone	0.1 m above Base Fish Scales Zone
7293	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	Duplicate of 7322
7315	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	1.0 m above creek
7316	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	2.0 m above creek
7317	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	3.0 m above creek
7318	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	4.0 m above creek
7319	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	4.5 m above creek
7320	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	5.0 m above creek
7321	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Bentonite	Colorado	Second White Specks	5.25 m above creek (10 cm bed)
7322	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	5.5 m above creek
7323	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	6.0 m above creek
7324	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	7.0 m above creek
7325	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	8.0 m above creek
7326	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	9.0 m above creek
7327	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	10.0 m above creek
7328	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Shale	Colorado	Second White Specks	11.0 m above creek
7329	C43	Birch Mtns - Asphalt Creek	2007	12	443512	6387776	651	Bone-bed shale	Colorado	Second White Specks	1.0 m above creek
7251	C44	Birch Mtns - Greystone Creek	2007	12	436714	6434287	509	Mudstone	Colorado	Pelican	-25.0 m from Base of Fish Scale Zone
7306	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale/sandstone	Colorado	Fish Scale Zone	Duplicate of 7337
7330	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale/mudstone	Colorado	Base of Fish Scale	0 m, Base of Fish Scale Zone contact
7331	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale/mudstone	Colorado	Belle Fourche	+6.3 m from Base of Fish Scale Zone
7332	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale/mudstone	Colorado	Fish Scale Zone	+5.3 m from Base of Fish Scale Zone
7333	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale/mudstone	Colorado	Fish Scale Zone	+4.3 m from Base of Fish Scale Zone
7334	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale/mudstone	Colorado	Fish Scale Zone	+3.3 m from Base of Fish Scale Zone
7335	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale	Colorado	Fish Scale Zone	+2.3m from Base of Fish Scale Zone
7336	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale/sandstone	Colorado	Fish Scale Zone	+1.3 m from Base of Fish Scale Zone
7337	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale/sandstone	Colorado	Fish Scale Zone	+0.1 m from Base of Fish Scale Zone
7338	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Shale/sandstone	Colorado	Fish Scale Zone	+0.8m from Base of Fish Scale Zone
7339	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone	Colorado	Westgate	-0.2 m from Base of Fish Scale Zone
7340	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone	Colorado	Westgate	-2.0 m from Base of Fish Scale Zone
7341	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone	Colorado	Westgate	-4.0 m from Base of Fish Scale Zone
7342	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone	Colorado	Westgate	-6.0 m from Base of Fish Scale Zone
7343	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone	Colorado	Westgate	-8.0 m from Base of Fish Scale Zone
7344	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone	Colorado	Westgate	-10.0 m from Base of Fish Scale Zone
7345	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone	Colorado	Westgate	-12.0 m from Base of Fish Scale Zone

Sample No.	Site No.	Site Location	Year	UTM (NAD 83)			Elevation (metres ASL)	Lithology	Formation or Group	Formation Division	Sample Depth and Description
				Zone	Easting	Northing					
7346	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone	Colorado	Westgate	-14.0 m from Base of Fish Scale Zone
7347	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Sandstone	Colorado	Pelican	-17.0 m from Base of Fish Scale Zone
7348	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone/sandstone	Colorado	Pelican	-21.0 m from Base of Fish Scale Zone
7350	C44	Birch Mtns - Greystone Creek	2007	12	436680	6434329	536	Mudstone	Colorado	Pelican	-23.0 m from Base of Fish Scale Zone
7252	C45	Cadomin - Blackstone railway sec.	2007	11	478167	5875014	1533	Shale	Colorado	Blackstone	3-4 m above Mountain Pk sandstone contact
7254	C45	Cadomin - Blackstone railway sec.	2007	11	478188	5875048	1534	Shale	Colorado	Blackstone	Sampled south to north along section
7255	C45	Cadomin - Blackstone railway sec.	2007	11	478188	5875048	1534	Shale	Colorado	Blackstone	Sampled south to north along section
7256	C45	Cadomin - Blackstone railway sec.	2007	11	478188	5875048	1534	Shale	Colorado	Blackstone	Sampled south to north along section
7257	C45	Cadomin - Blackstone railway sec.	2007	11	478217	5875092	1530	Shale	Colorado	Blackstone	Sampled south to north along section
7258	C45	Cadomin - Blackstone railway sec.	2007	11	478387	5875406	1537	Shale	Colorado	Blackstone	Sampled south to north along section
7259	C45	Cadomin - Blackstone railway sec.	2007	11	478445	5875515	1532	Shale	Colorado	Blackstone	Sampled south to north along section
7260	C45	Cadomin - Blackstone railway sec.	2007	11	478483	58775665	1523	Sulphide	Colorado	Blackstone	Sampled south to north along section
7261	C45	Cadomin - Blackstone railway sec.	2007	11	478504	5875769	1522	Shale	Colorado	Blackstone	Sampled south to north along section
7262	C45	Cadomin - Blackstone railway sec.	2007	11	478504	5875769	1522	Shale	Colorado	Blackstone	Sampled south to north along section
7263	C45	Cadomin - Blackstone railway sec.	2007	11	478504	5875769	1522	Shale	Colorado	Blackstone	Sampled south to north along section
7264	C45	Cadomin - Blackstone railway sec.	2007	11	478504	5875769	1522	Shale	Colorado	Blackstone	Sampled south to north along section
7265	C45	Cadomin - Blackstone railway sec.	2007	11	478504	5875769	1522	Shale	Colorado	Blackstone	Sampled south to north along section
7266	C45	Cadomin - Blackstone railway sec.	2007	11	478498	5875885	1522	Shale	Colorado	Blackstone	Sampled south to north along section
7267	C45	Cadomin - Blackstone railway sec.	2007	11	478498	5875885	1522	Shale	Colorado	Blackstone	Sampled south to north along section
7269	C45	Cadomin - Blackstone railway sec.	2007	11	478497	5876037	1519	Shale	Colorado	Blackstone	Sampled south to north along section
7270	C45	Cadomin - Blackstone railway sec.	2007	11	478497	5876037	1519	Shale	Colorado	Blackstone	Sampled south to north along section
7271	C45	Cadomin - Blackstone railway sec.	2007	11	478497	5876037	1519	Shale	Colorado	Blackstone	Sampled south to north along section
7272	C45	Cadomin - Blackstone railway sec.	2007	11	478497	5876037	1519	Shale	Colorado	Blackstone	Sampled south to north along section
7273	C45	Cadomin - Blackstone railway sec.	2007	11	478522	5876250	1518	Shale	Colorado	Blackstone	Sampled south to north along section
7274	C45	Cadomin - Blackstone railway sec.	2007	11	478522	5876250	1518	Shale	Colorado	Blackstone	Sampled south to north along section
7275	C45	Cadomin - Blackstone railway sec.	2007	11	478551	5876680	1522	Shale	Colorado	Blackstone	Sampled south to north along section
7276	C45	Cadomin - Blackstone railway sec.	2007	11	478558	5876830	1518	Shale	Colorado	Blackstone	Sampled south to north along section
7280	C45	Cadomin - Blackstone railway sec.	2007	11	478592	5877460	1502	Shale	Colorado	Blackstone	Sampled south to north along section
7281	C45	Cadomin - Blackstone railway sec.	2007	11	478523	5877234	1505	Shale	Colorado	Blackstone	Sampled south to north along section
7282	C45	Cadomin - Blackstone railway sec.	2007	11	479087	5878965	1513	Shale	Colorado	Blackstone	27.5 m below Cardium sandstone contact
7283	C45	Cadomin - Blackstone railway sec.	2007	11	479087	5878965	1513	Shale	Colorado	Blackstone	17.5-18.5 m below Cardium sandstone contact
7284	C45	Cadomin - Blackstone railway sec.	2007	11	479087	5878965	1513	Shale	Colorado	Blackstone	9.5-10.5 m below Cardium sandstone contact
7285	C45	Cadomin - Blackstone railway sec.	2007	11	479087	5878965	1513	Shale	Colorado	Blackstone	1.0 m below Cardium sandstone contact
7286	C45	Cadomin - Blackstone railway sec.	2007	11	479087	5878965	1513	Shale	Colorado	Blackstone	~52 m below Cardium sandstone contact
6544		AGS Standard	2007	AGS Standard	AGS Standard	AGS Standard	AGS Standard	Rock powder	AGS Standard	AGS Standard	AGS Standard
6914		AGS Standard	2007	AGS Standard	AGS Standard	AGS Standard	AGS Standard	Rock powder	AGS Standard	AGS Standard	AGS Standard
7253		AGS Standard	2007	AGS Standard	AGS Standard	AGS Standard	AGS Standard	Rock powder	AGS Standard	AGS Standard	AGS Standard
7279		AGS Standard	2007	AGS Standard	AGS Standard	AGS Standard	AGS Standard	Rock powder	AGS Standard	AGS Standard	AGS Standard
7349		AGS Standard	2007	AGS Standard	AGS Standard	AGS Standard	AGS Standard	Rock powder	AGS Standard	AGS Standard	AGS Standard

Appendix 3 – Colorado Group Core Samples Analyzed

Legend

Y = Sample data presented in this report

x = Sample data presented in other Alberta Geological Survey reports (see Table 1 for details)

Analyses presented in this report

Column Label	Label Description
Sample No.	AGS sample number
Site No.	Site location number
Rock Eval™	Analysis to test for organic maturity and total organic carbon (TOC)
X-ray Diff-Bulk	X-Ray diffraction analysis of whole-rock mineralogy
X-ray Diff-Clay	X-Ray diffraction analysis of clay mineralogy
Organic Pet.	Organic petrology examines organic macerals
Thin Section	Thin section of sample
Thin Section Photo	Photograph of thin section
Adsorption Isotherm	Gas adsorption analysis to determine gas-holding capacity of sample
SEM	Scanning Electron Microscope
ESEM	Environmental Scanning Electron Microscope
Mini-perm	Analysis to determine permeability
Porosimetry	Analysis to determine porosity

Sample No.	Site No.	Rock Eval™	X-Ray Diff-Bulk	X-Ray Diff-Clay	Organic Pet.	Thin Section	Thin Section Photo	Adsorption Isotherm	SEM	ESEM	Mini-perm	Porosity
8501	C01	Y										x
8502	C01	Y										
8503	C01	Y										
8504	C01	Y										
8505	C01	Y										x
8506	C01	Y										
8668	C02	Y										x
8669	C02	Y									x	
8670	C02	Y										
8671	C02	Y										
8627	C03	Y										
8628	C03	Y	x	x								
8629	C03	Y										
8630	C03	Y										
8631	C03	Y										x
8632	C03	Y				x	x					
8034	C04	Y										
8035	C04	Y										
8531	C05	Y										
8532	C05	Y										
8533	C05	Y										
8534	C05	Y										
8644	C06	Y										
8645	C06	Y										
8646	C06	Y										
8647	C06	Y				x						x
8540	C07	Y				x						x
8541	C07	Y										
8581	C08	Y										
8582	C08	Y										
8583	C08	Y										
8584	C08	Y										
8585	C08	Y										
8586	C08	Y										
8587	C08	Y										
8588	C08	Y										x
8589	C08	Y										
8590	C08	Y										
8591	C08	Y										
8592	C08	Y										
8593	C08	Y										
8594	C08	Y										
8595	C08	Y										
8529	C09	Y										
8530	C09	Y										x
8575	C10	Y										x
8576	C10	Y										
8577	C10	Y										
8578	C10	Y										
8579	C10	Y										
8580	C10	Y										
8042	C11	Y						Y				
8606	C11	Y				x						
8607	C11	Y										
8608	C11	Y										
8609	C11	Y	x	x								
8610	C11	Y										
8611	C11	Y								x		x
8612	C11	Y										
8613	C12	Y										
8614	C12	Y				x						x
8507	C13	Y										x
8508	C13	Y										
8509	C13	Y										
8510	C13	Y										
8511	C13	Y										
8512	C13	Y				x						x
8041	C14	Y						Y				
8521	C14	Y										
8522	C14	Y				x						
8523	C14	Y										
8524	C14	Y										

Sample		Rock	X-Ray	X-Ray	Organic	Thin	Thin	Adsorption			Mini	
8525	C14	Y										
8526	C14	Y	x	x								
8527	C14	Y										
8528	C14	Y										
8535	C15	Y										
8536	C15	Y										
8537	C15	Y								x		x
8538	C15	Y										
8539	C15	Y										
8556	C16	Y										
8557	C16	Y										
8558	C16	Y										
8559	C16	Y										
8560	C16	Y										
8561	C16	Y										x
8542	C17	Y							x	x		x
8543	C17	Y										
8544	C17	Y										
7294	C18	Y										
7295	C18	Y										
7296	C18	Y										
7297	C18	Y				x						
7298	C18	Y	x	x								
7299	C18	Y										
7300	C18	Y										x
8641	C19	Y										
8642	C19	Y										
8643	C19	Y				x						x
8045	C20	Y						Y				
8648	C20	Y										
8649	C20	Y										
8650	C20	Y										
8651	C20	Y										x
8652	C20	Y										
8653	C20	Y										
8654	C20	Y										
8655	C20	Y										
8656	C20	Y				x					x	
8657	C20	Y	x	x								
8658	C20	Y										
8659	C20	Y										
8660	C20	Y										
8661	C20	Y										
8662	C20	Y										
8663	C20	Y										
8554	C21	Y										
8555	C21	Y										
7289	C22	Y										
7290	C22	Y										
7291	C22	Y										
7292	C22	Y				x	x				x	x
8048	C23		x	x								
8664	C23	Y										
8665	C23	Y										x
8666	C23	Y										
8667	C23	Y										
8029	C24	Y										x
8548	C25	Y										
8549	C25	Y										
8550	C25	Y										
8551	C25	Y										x
8552	C25	Y				x	x					x
8553	C25	Y										
8620	C26	Y				x						x
8621	C26	Y										
8622	C26	Y										
8623	C26	Y										
8624	C26	Y										x
8625	C26	Y										
8626	C26	Y										
8566	C27	Y				x						
8567	C27	Y										
8568	C27	Y										
8569	C27	Y										x

Sample		Rock	X-Ray	X-Ray	Organic	Thin	Thin	Adsorption			Mini	
8570	C27	Y										
8571	C27	Y										
8572	C27	Y										
8573	C27	Y										
8574	C27	Y										
8637	C28	Y										
8638	C28	Y				x						x
8639	C28	Y										
8640	C28	Y										
8562	C29	Y										
8563	C29	Y				x						x
8564	C29	Y										
8565	C29	Y				x				x		
8023	C30	Y										
8024	C30	Y										
8513	C30	Y										
8514	C30	Y				x						
8515	C30	Y										x
8516	C30	Y									x	
8545	C31	Y										
8546	C31	Y										
8547	C31	Y										x
8633	C32	Y										
8634	C32	Y				x					x	
8635	C32	Y										
8636	C32	Y										
8596	C33	Y									x	
8597	C33	Y										
8598	C33	Y										
8599	C33	Y										
8600	C33	Y										x
8601	C33	Y										
8602	C33	Y										x
8603	C33	Y										
8604	C33	Y										x
8605	C33	Y										
8043	C34	Y						Y				
8044	C34	Y						Y				
8615	C34	Y										
8616	C34	Y										x
8617	C34	Y				x	x					
8618	C34	Y										
8619	C34	Y				x						
8517	C35	Y										
8518	C35	Y				x	x		x	x		x
8519	C35	Y										
8520	C35	Y				x						
8036	C36	Y										
8037	C36	Y										x
6901	C37	Y										
6902	C37	Y	x	x								
6903	C37	Y										
6904	C37	Y				x	x					x
6905	C37	Y										
6906	C37	Y										
8032	C37	Y										
8033	C37	Y										
8025	C38	Y										x
8026	C38	Y										
8027	C38	Y				x					x	
8028	C38	Y										
6916	Duplicate	Y										
8672	Duplicate	Y										
8673	Duplicate	Y										
8674	Duplicate	Y										
8675	Duplicate	Y										
8676	Duplicate	Y										
8677	Duplicate	Y										
8030	Resample											
8031	Resample										x	

Appendix 4 – Colorado Group Outcrop Samples Analyzed

Legend

Y = Sample data presented in this report

x = Sample data presented in other Alberta Geological Survey reports (see Table 1 for details)

xx = Clay separated

Analyses presented in this report

Column Label	Label Description
Sample No.	AGS sample number
Site No.	Site location number
Inorganic Geochem	Inorganic geochemical analysis
Rock Eval™	Analysis for organic maturity and total organic carbon (TOC)
X-ray Diff-Bulk	X-Ray diffraction analysis of whole-rock mineralogy
X-ray Diff-Clay	X-Ray diffraction analysis of clay mineralogy
Organic Pet.	Organic petrology examines organic macerals
Thin Section	Thin section of sample
Thin Section Photo	Photograph of thin section
Adsorption Isotherm	Gas adsorption analysis to determine gas bearing capacity

Sample No.	Site No,	Inorganic Geochem	Rock Eval™	X-Ray Diff-Bulk	X-Ray Diff-Clay	Organic Pet.	Thin Section	Thin Section Photo	Adsorption Isotherm
5746	C39	x	Y	x	x				
5747	C40	x	Y	x	x				
5748	C41	x	Y	x	x				
6825	C42	x	Y	x	x				
6826	C42	x	Y	x	x				
6827	C42	x	Y	x	x	Y			
7293	C43	x	Y			Y			
7315	C43	x	Y	x	xx				
7316	C43	x	Y	x	x				
7317	C43	x	Y	x	x	Y			
7318	C43	x	Y	x	xx				Y
7319	C43	x	Y	x	x	Y			
7320	C43	x	Y	x	x				
7321	C43	x							
7322	C43	x	Y	x	x				
7323	C43	x	Y	x	x				
7324	C43	x	Y	x	x				
7325	C43	x	Y	x	x				
7326	C43	x	Y	x	x				
7327	C43	x	Y	x	xx				Y
7328	C43	x	Y	x	x				
7329	C43	x	Y			Y	x	x	
7251	C44	x	Y	x	xx				Y
7306	C44	x	Y						
7330	C44	x	Y	x	x	Y			
7331	C44	x	Y	x	x				
7332	C44	x	Y	x	xx				
7333	C44	x	Y	x	x				
7334	C44	x	Y	x	x				
7335	C44	x	Y	x	xx				
7336	C44	x	Y	x	x				
7337	C44	x	Y	x	x				
7338	C44	x	Y	x	xx	Y			Y
7339	C44	x	Y	x	x				
7340	C44	x	Y	x	xx				
7341	C44	x	Y	x	x				
7342	C44	x	Y	x	x				
7343	C44	x	Y	x	xx	Y			Y
7344	C44	x	Y	x	x				
7345	C44	x	Y	x	x				
7346	C44	x	Y	x	x				
7347	C44								
7348	C44	x	Y	x	x				
7350	C44	x	Y	x	x				

Sample No.	Site No,	Inorganic Geochem	Rock Eval™	X-Ray Diff-Bulk	X-Ray Diff-Clay	Organic Pet.	Thin Section	Thin Section Photo	Adsorption Isotherm
7252	C45	x	Y	x	x				
7254	C45	x	Y	x	x		x	x	
7255	C45	x	Y	x	x				
7256	C45	x	Y	x	x				
7257	C45	x	Y	x	xx				Y
7258	C45	x	Y	x	x				
7259	C45	x	Y	x	x				
7260	C45	x							
7261	C45	x	Y	x	x				
7262	C45	x	Y	x	x				
7263	C45	x	Y	x	x				
7264	C45	x	Y	x	x	Y			
7265	C45	x	Y	x	x				
7266	C45	x	Y	x	x				
7267	C45	x	Y	x	x	Y			
7269	C45	x	Y	x	xx				
7270	C45	x	Y	x	x				
7271	C45	x	Y	x	x				
7272	C45	x	Y	x	x				
7273	C45	x	Y	x	x				
7274	C45	x	Y	x	x				
7275	C45	x	Y	x	x	Y			
7276	C45	x	Y	x	x				
7280	C45	x	Y	x	x				
7281	C45	x	Y	x	x				
7282	C45	x	Y	x	x				
7283	C45	x	Y	x	x				
7284	C45	x	Y	x	x				
7285	C45	x	Y	x	x				
7286	C45	x	Y	x	xx				Y
6544		x							
6914		x							
7253		x							
7279		x							
7349		x							

Appendix 5 – Colorado Group Isotherm Summary

Appendix 5a – Adsorption Isotherm Summary

Legend

Column Label	Label Description
Sample No.	AGS sample number
Depth (metres)	Sample depth in metres (measured from core)
TOC (%)	Total organic carbon in weight per cent
Analysis Temperature (°C)	Temperature in degrees Celsius
As Received Moisture (%)	Sample moisture content in weight per cent
Langmuir Pressure	Pressure - Langmuir pressure
Langmuir Volume	Volume - Langmuir volume
MPa	Megapascals
scc/g	Standard cubic centimetres per gram

Sample No.	Depth (metres)	TOC (%)	Analysis Temperature (°C)	As Received Moisture (%)	Langmuir Pressure Raw Basis (MPa)	Langmuir Volume Raw Basis (scc/g)
7251	outcrop	0.83	33	4.57	3.28	1.01
7257	outcrop	1.4	33	3.32	6.29	0.68
7286	outcrop	0.68	38	1.29	9.78	0.23
7318	outcrop	11.90	33	9.83	6.84	2.64
7327	outcrop	1.31	33	4.30	15.86	6.47
7338	outcrop	2.14	33	3.72	8.44	3.15
7343	outcrop	1.82	33	4.80	10.93	6.02
8041	548.8	5.18	25	2.30	5.81	2.34
8042	2319.7	1.75	50	0.51	9.09	0.64
8043	2319.1	1.73	60	0.74	7.32	0.77
8044	2480.0	3.20	60	0.82	6.96	1.43
8045	1816.6	2.92	50	0.75	7.71	1.33

Appendix 5b – Adsorption Isotherm Point Data

Legend

Column Label	Label Description
Sample No.	AGS sample number
Point No.	Individual measurement
MPa	Megapascals
scc/g	Standard cubic centimetres per gram

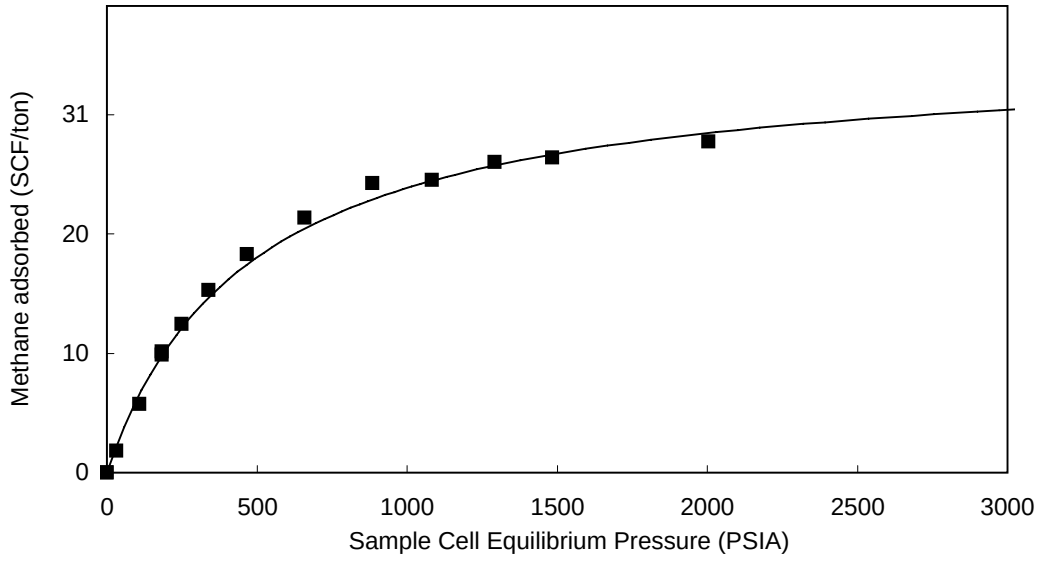
Sample No.	Point No.	Pressure (MPa)	Gas Content Raw Basis (scc/g)
7251	1	0.22	0.05
	2	0.75	0.16
	3	1.26	0.28
	4	1.26	0.29
	5	1.72	0.36
	6	2.34	0.44
	7	3.22	0.52
	8	4.54	0.61
	9	6.10	0.70
	10	7.46	0.70
	11	8.91	0.75
	12	10.24	0.76
	13	13.82	0.80
7257	1	0.40	0.04
	2	0.82	0.08
	3	1.28	0.13
	4	1.76	0.17
	5	2.25	0.18
	6	2.74	0.21
	7	3.35	0.23
	8	4.08	0.24
	9	5.27	0.28
	10	6.62	0.33
	11	9.18	0.41
	12	12.87	0.46
	13	15.18	0.49
7286	1	0.37	0.01
	2	0.79	0.02
	3	1.24	0.02
	4	1.69	0.03
	5	2.18	0.04
	6	2.67	0.05
	7	3.29	0.05
	8	4.00	0.07
	9	5.21	0.09
	10	6.59	0.09
	11	7.55	0.10
	12	9.56	0.12
	13	13.87	0.14
7318	1	0.56	0.22
	2	1.04	0.37
	3	1.53	0.49
	4	2.00	0.61
	5	2.49	0.70
	6	2.98	0.79
	7	3.61	0.87
	8	4.33	0.94
	9	5.43	1.13
	10	6.77	1.32
	11	8.07	1.44
	12	9.14	1.55
	13	12.57	1.73
7327	1	0.53	0.22
	2	1.01	0.40
	3	1.51	0.56
	4	1.96	0.70

Sample No.	Point No.	Pressure (MPa)	Gas Content Raw Basis (scc/g)
	5	2.45	0.88
	6	2.94	1.00
	7	3.57	1.13
	8	4.25	1.33
	9	5.34	1.60
	10	6.59	1.90
	11	7.98	2.16
	12	9.13	2.42
	13	12.87	2.92
7338	1	0.58	0.22
	2	1.01	0.35
	3	1.48	0.48
	4	2.04	0.61
	5	2.52	0.70
	6	2.97	0.78
	7	4.01	0.96
	8	5.28	1.17
	9	6.65	1.40
	10	8.00	1.53
	11	9.09	1.65
	12	12.53	1.91
7343	1	0.53	0.26
	2	0.99	0.51
	3	1.49	0.75
	4	1.96	0.94
	5	2.43	1.10
	6	2.92	1.27
	7	3.50	1.43
	8	4.21	1.65
	9	5.34	2.00
	10	6.71	2.26
	11	7.99	2.60
	12	9.09	2.75
	13	12.97	3.23
8041	1	0.38	0.14
	2	0.74	0.27
	3	1.44	0.46
	4	2.50	0.67
	5	3.55	0.92
	6	5.58	1.18
	7	8.34	1.40
	8	10.85	1.53
	9	14.11	1.64
8042	1	0.45	0.03
	2	0.92	0.06
	3	1.48	0.09
	4	2.88	0.15
	5	5.74	0.25
	6	8.61	0.31
	7	11.51	0.36
	8	15.51	0.41
	9	20.34	0.45
8043	1	0.41	0.05
	2	0.79	0.08
	3	1.53	0.12
	4	2.96	0.20

Sample No.	Point No.	Pressure (MPa)	Gas Content Raw Basis (scc/g)
	5	5.58	0.33
	6	8.54	0.43
	7	11.42	0.48
	8	15.55	0.53
	9	19.57	0.56
8044	1	0.41	0.08
	2	0.79	0.15
	3	1.52	0.24
	4	2.94	0.40
	5	5.56	0.63
	6	8.52	0.80
	7	11.42	0.91
	8	15.62	1.01
	9	19.51	1.04
8045	1	0.45	0.08
	2	0.93	0.15
	3	1.48	0.21
	4	2.87	0.34
	5	5.77	0.56
	6	8.65	0.70
	7	11.47	0.81
	8	15.51	0.91
	9	20.39	0.96

Appendix 5c – Adsorption Isotherm Graphs

AGS 7251



Pressure (PSIA)	Adsorbed gas (ft^3 /ton) In-Situ
32	1.8
109	5.6
183	9.6
182	9.9
250	12.2
339	14.9
467	17.8
659	20.9
885	23.7
1082	23.9
1292	25.4
1485	25.8
2004	27.1

Langmuir Parameters

	In-Situ
Vol. (ft^3 /ton)	34.4
Pressure (PSIA)	475.4

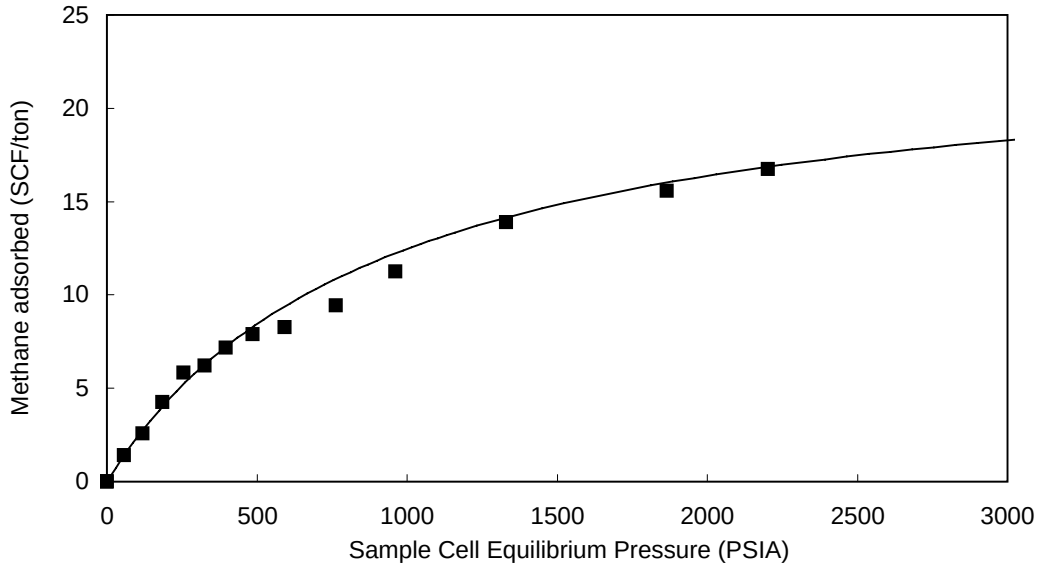
SUMMARY OF ADSORPTION ANALYSES IMP. UNITS

Isotherm Temperature: **91.4 ºF**

Goodness of fit of Langmuir regression: **0.99**

% Moisture= **4.57** **Density g/cc** **2.460**

AGS 7257



Pressure (PSIA)	Adsorbed gas (ft^3 /ton) In-Situ
57	1.4
119	2.6
186	4.3
255	5.8
326	6.2
398	7.2
486	7.9
592	8.3
764	9.4
961	11.3
1331	13.9
1867	15.6
2202	16.7

Langmuir Parameters

	In-Situ
Vol. (ft^3 /ton)	23.1
Pressure (PSIA)	912.6

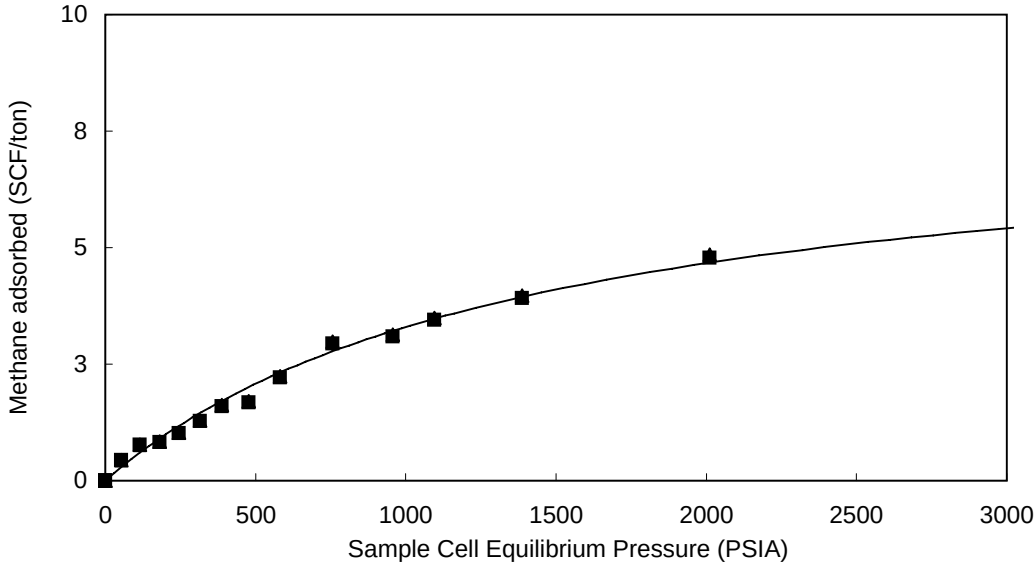
SUMMARY OF ADSORPTION ANALYSES IMP. UNITS

Isotherm Temperature: **91.4 ºF**

Goodness of fit of Langmuir regression: **0.98**

% Moisture= **3.32** **Density g/cc** **2.615**

AGS 7286



Pressure (PSIA)	Adsorbed gas (ft^3 /ton) In-Situ
54	0.4
114	0.8
180	0.8
245	1.0
316	1.3
387	1.6
478	1.7
581	2.2
756	2.9
956	3.1
1096	3.4
1387	3.9
2011	4.8

Langmuir Parameters

	In-Situ
Vol. (ft^3 /ton)	7.9
Pressure (PSIA)	1418.0

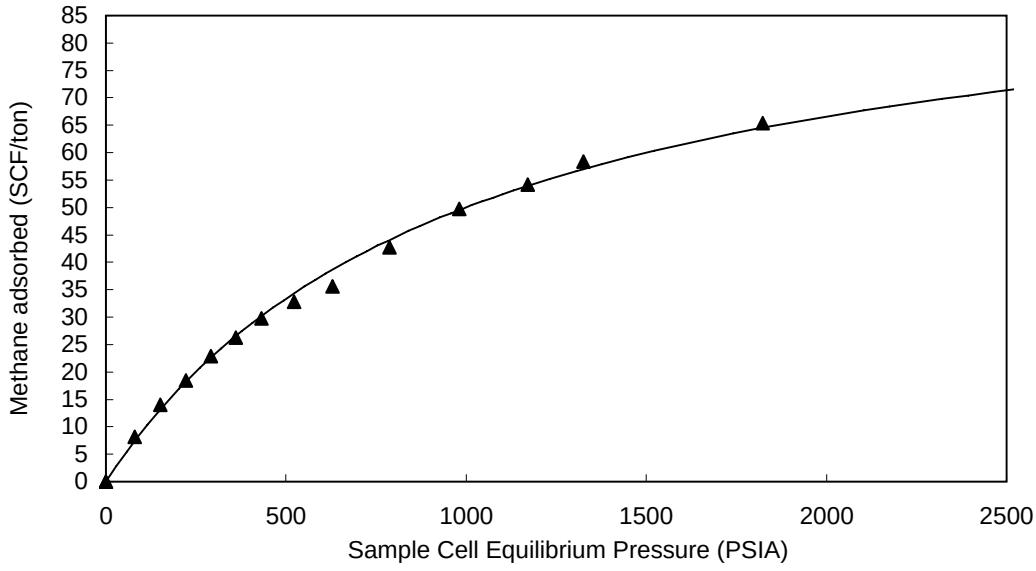
SUMMARY OF ADSORPTION ANALYSES IMP. UNITS

Isotherm Temperature: **100.4 ºF**

Goodness of fit of Langmuir regression: **0.85**

% Moisture= **1.29** **Density g/cc** **2.589**

AGS 7318



Pressure (PSIA)	Adsorbed gas (ft^3 /ton) In-Situ
81	7.4
150	12.7
222	16.6
291	20.6
360	23.7
432	26.8
523	29.6
628	32.1
788	38.6
981	44.9
1171	48.9
1326	52.6
1823	58.9

Langmuir Parameters

	In-Situ
Vol. (ft^3 /ton)	89.9
Pressure (PSIA)	992.6

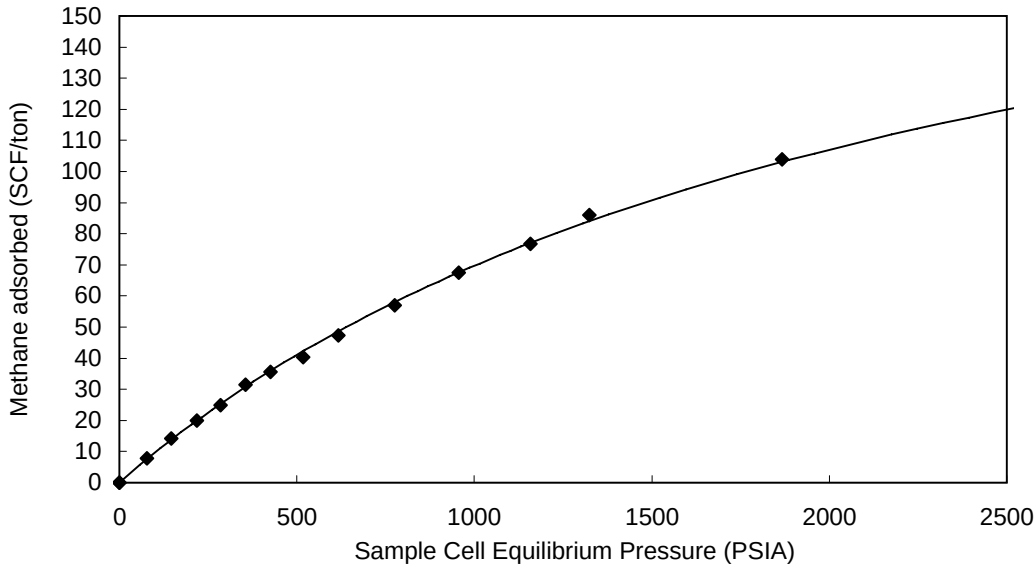
SUMMARY OF ADSORPTION ANALYSES IMP. UNITS

Isotherm Temperature: **91.4 ºF**

Goodness of fit of Langmuir regression: **0.99**

% Moisture= **9.83** **Density g/cc** **2.116**

AGS 7327



Pressure (PSIA)	Adsorbed gas (ft^3 /ton) In-Situ
77	7.5
147	13.5
218	19.2
285	23.9
356	30.1
426	34.1
517	38.6
617	45.3
775	54.5
956	64.6
1158	73.4
1324	82.2
1866	99.4

Langmuir Parameters

	In-Situ
Vol. (ft^3 /ton)	220.2
Pressure (PSIA)	2300.2

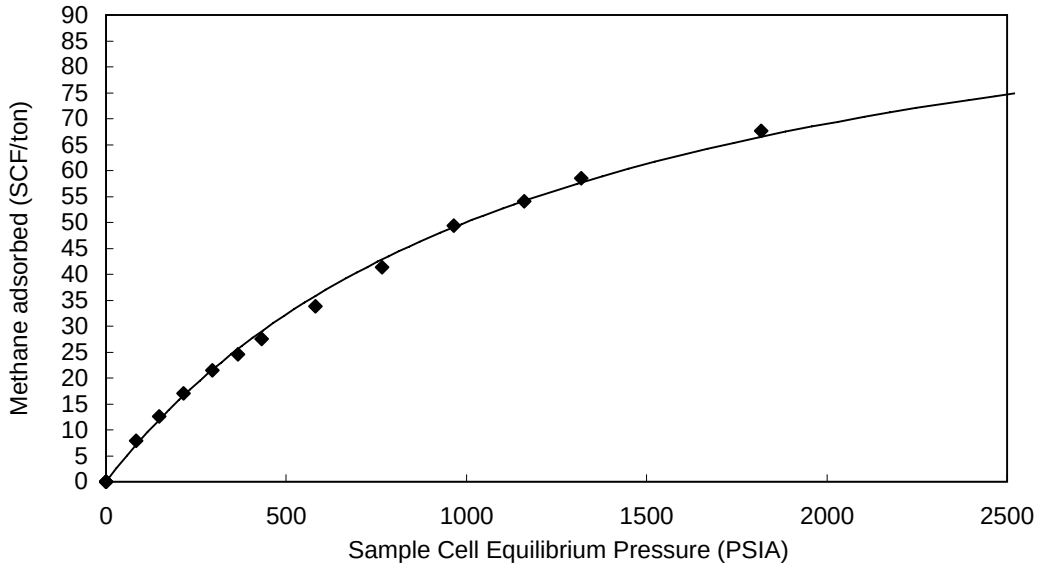
SUMMARY OF ADSORPTION ANALYSES IMP. UNITS

Isotherm Temperature: **91.4 ºF**

Goodness of fit of Langmuir regression: **0.98**

% Moisture= **4.30** **Density g/cc** **2.559**

AGS 7338



Pressure (PSIA)	Adsorbed gas (ft^3 /ton) In-Situ
84	7.6
147	12.1
215	16.5
295	20.7
365	23.7
431	26.5
581	32.6
766	39.8
964	47.5
1160	52.1
1319	56.3
1817	65.2

Langmuir Parameters

	In-Situ
Vol. (ft^3 /ton)	107.2
Pressure (PSIA)	1224.2

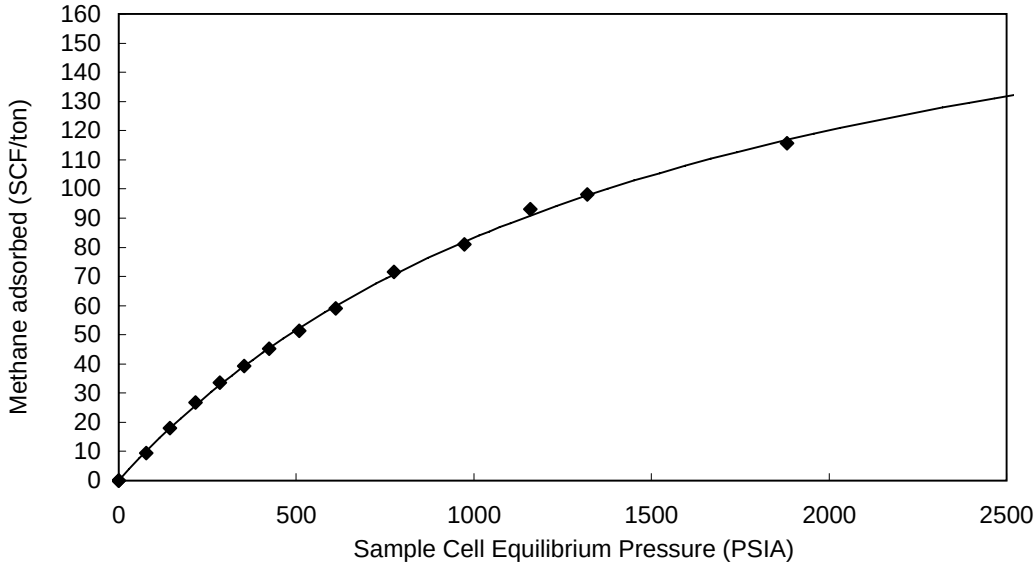
SUMMARY OF ADSORPTION ANALYSES IMP. UNITS

Isotherm Temperature: **91.4 °F**

Goodness of fit of Langmuir regression: **0.98**

% Moisture= **3.72** **Density g/cc** **2.463**

AGS 7343



Pressure (PSIA)	Adsorbed gas (ft^3 /ton) In-Situ
77	8.9
144	17.2
216	25.5
285	32.0
353	37.5
424	43.1
508	48.8
610	56.3
775	68.1
973	77.0
1159	88.6
1319	93.5
1881	110.0

Langmuir Parameters

	In-Situ
Vol. (ft^3 /ton)	204.9
Pressure (PSIA)	1585.8

SUMMARY OF ADSORPTION ANALYSES IMP. UNITS

Isotherm Temperature: **91.4 ºF**

Goodness of fit of Langmuir regression: **0.99**

% Moisture= **4.80** **Density g/cc** **2.463**

Methane Adsorption Isotherm

Alberta Geological Survey **Well: 100/06-23-043-11W4**
Sample: 8041 **Depth: 548.8 m**
Raw Basis **TOC = 5.18%**

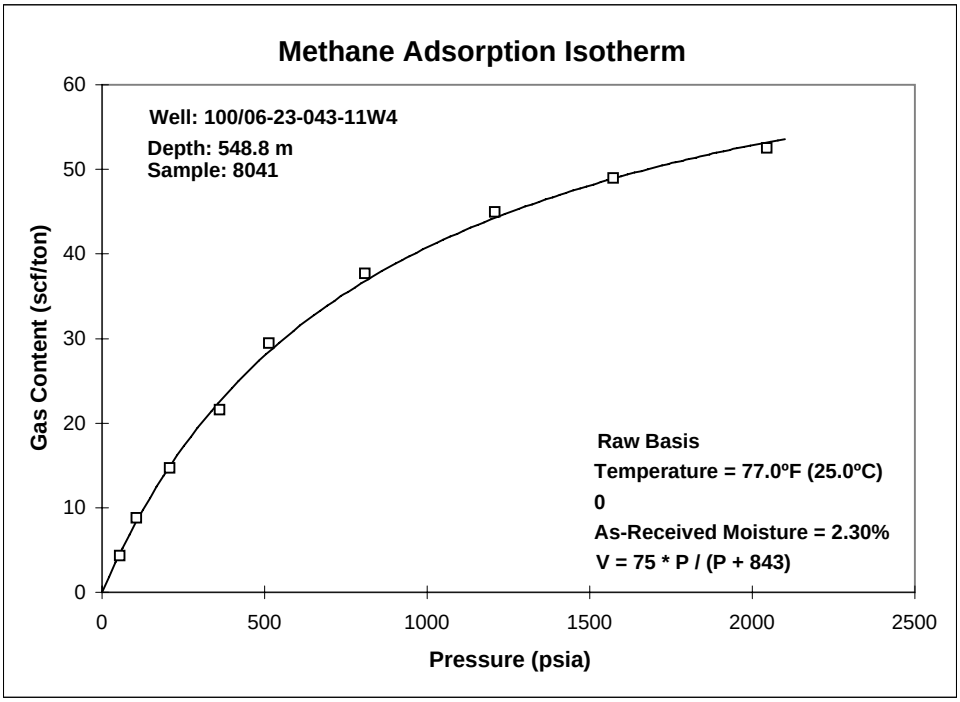
Sample Weight = 192.01 g Particle Size = < 12 Mesh Temperature = 77.0ºF (25.0ºC)	As-Received Moisture = 2.30%

Methane Adsorption

Pressure		Gas Content (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
55	0.38	4.4	0.14
107	0.74	8.8	0.27
209	1.44	14.7	0.46
362	2.50	21.6	0.67
515	3.55	29.4	0.92
809	5.58	37.7	1.18
1,209	8.34	44.9	1.40
1,574	10.85	48.9	1.53
2,046	14.11	52.6	1.64

Langmuir Coefficients **V = 75.1 * P / (P + 842.6)**

PL		VL (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
842.6	5.81	75.1	2.3



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Methane Adsorption Isotherm

Alberta Geological Survey **Well: 100/06-17-030-03W5/00**
Sample: 8042 **Depth: 2319.7 m**
Raw Basis **TOC = 1.75%**

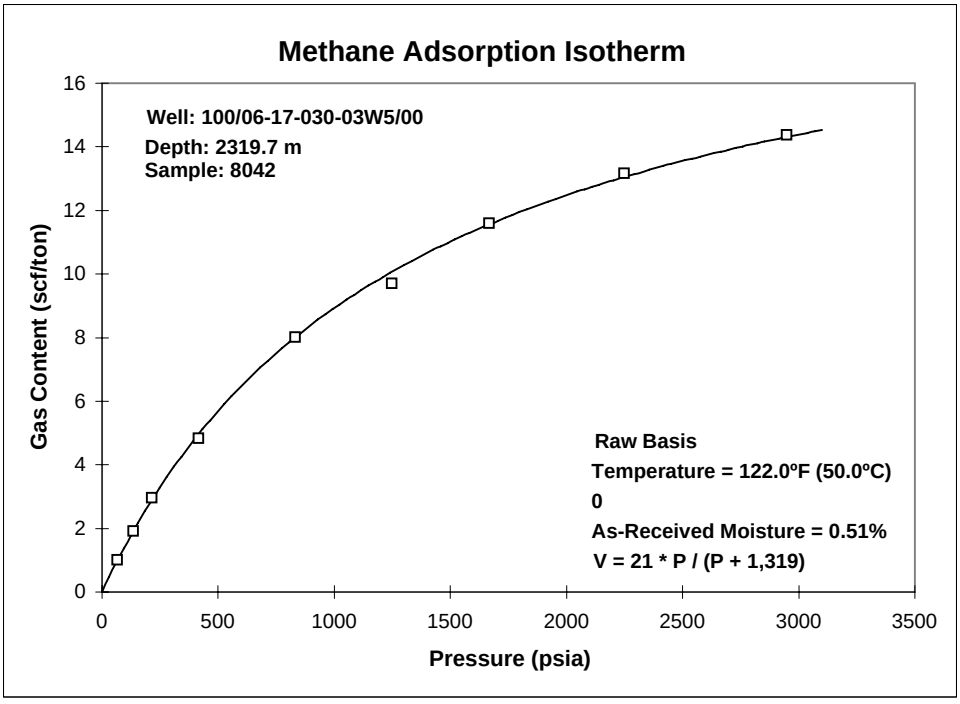
Sample Weight = 232.19 g	
Particle Size = < 12 Mesh	As-Received Moisture = 0.51%
Temperature = 122.0ºF (50.0ºC)	

Methane Adsorption

Pressure		Gas Content (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
65	0.45	1.0	0.03
134	0.92	1.9	0.06
214	1.48	3.0	0.09
417	2.88	4.9	0.15
832	5.74	8.1	0.25
1,249	8.61	9.8	0.31
1,669	11.51	11.6	0.36
2,249	15.51	13.1	0.41
2,950	20.34	14.3	0.45

Langmuir Coefficients **V = 20.7 * P / (P + 1,318.5)**

PL		VL (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
1,318.5	9.09	20.7	0.6



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Methane Adsorption Isotherm

Alberta Geological Survey **Well: 100/16-29-054-21W5/00**
Sample: 8043 **Depth: 2319.1 m**
Raw Basis **TOC = 1.73%**

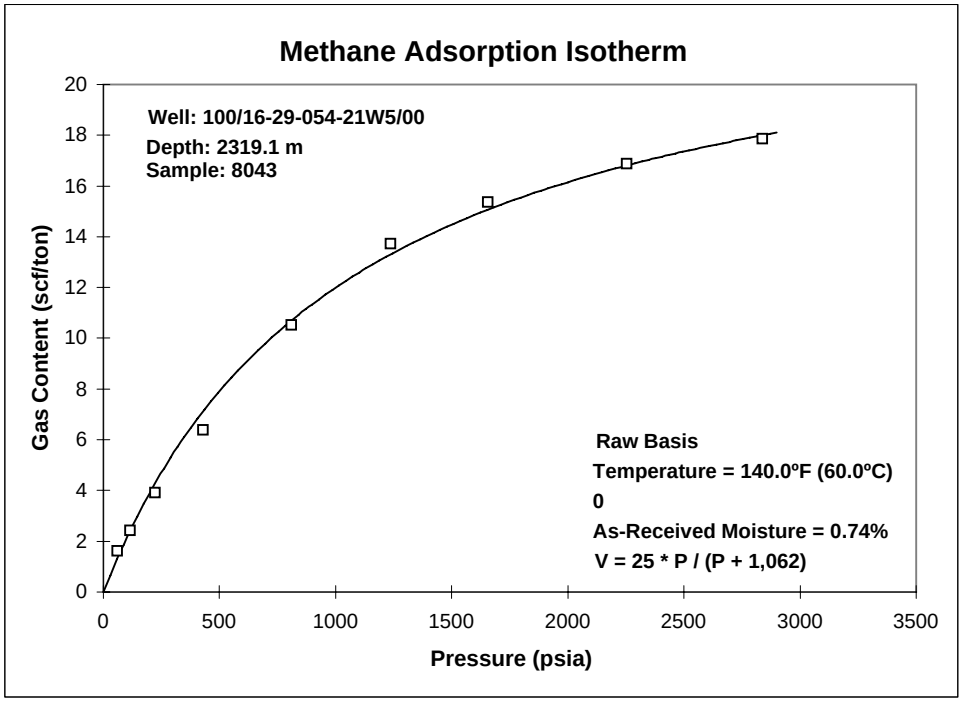
Sample Weight = 230.58 g
Particle Size = < 12 Mesh
Temperature = 140.0ºF (60.0ºC)
As-Received Moisture = 0.74%

Methane Adsorption

Pressure		Gas Content (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
59	0.41	1.6	0.05
115	0.79	2.5	0.08
222	1.53	4.0	0.12
429	2.96	6.4	0.20
809	5.58	10.5	0.33
1,238	8.54	13.7	0.43
1,656	11.42	15.4	0.48
2,255	15.55	16.9	0.53
2,838	19.57	17.9	0.56

Langmuir Coefficients **V = 24.7 * P / (P + 1,061.5)**

PL		VL (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
1,061.5	7.32	24.7	0.8



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Methane Adsorption Isotherm

Alberta Geological Survey **Well: 100/16-29-054-21W5/00**
Sample: 8044 **Depth: 2480 m**
Raw Basis **TOC = 3.20**

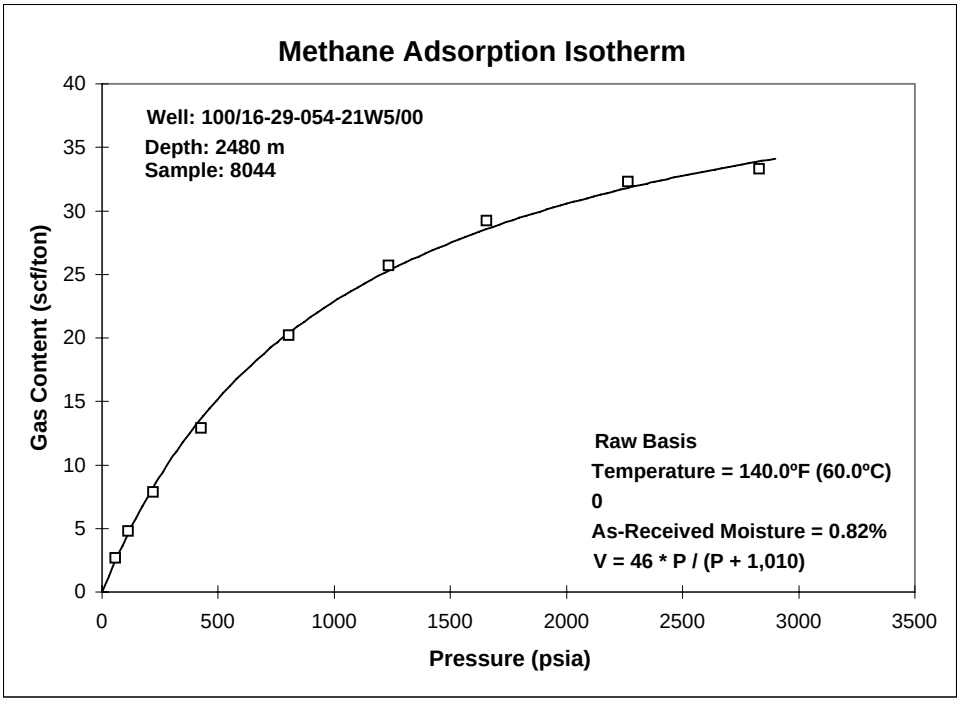
Sample Weight = 228.99 g	
Particle Size = < 12 Mesh	As-Received Moisture = 0.82%
Temperature = 140.0ºF (60.0ºC)	

Methane Adsorption

Pressure		Gas Content (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
59	0.41	2.7	0.08
114	0.79	4.9	0.15
220	1.52	7.8	0.24
426	2.94	12.9	0.40
806	5.56	20.2	0.63
1,236	8.52	25.7	0.80
1,657	11.42	29.3	0.91
2,266	15.62	32.3	1.01
2,830	19.51	33.3	1.04

Langmuir Coefficients **V = 46.0 * P / (P + 1,009.6)**

PL		VL (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
1,009.6	6.96	46.0	1.4



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Methane Adsorption Isotherm

Alberta Geological Survey **Well: 100/07-19-045-06W5/00**
Sample: 8045 **Depth: 1816.6 m**
Raw Basis **TOC = 2.92%**

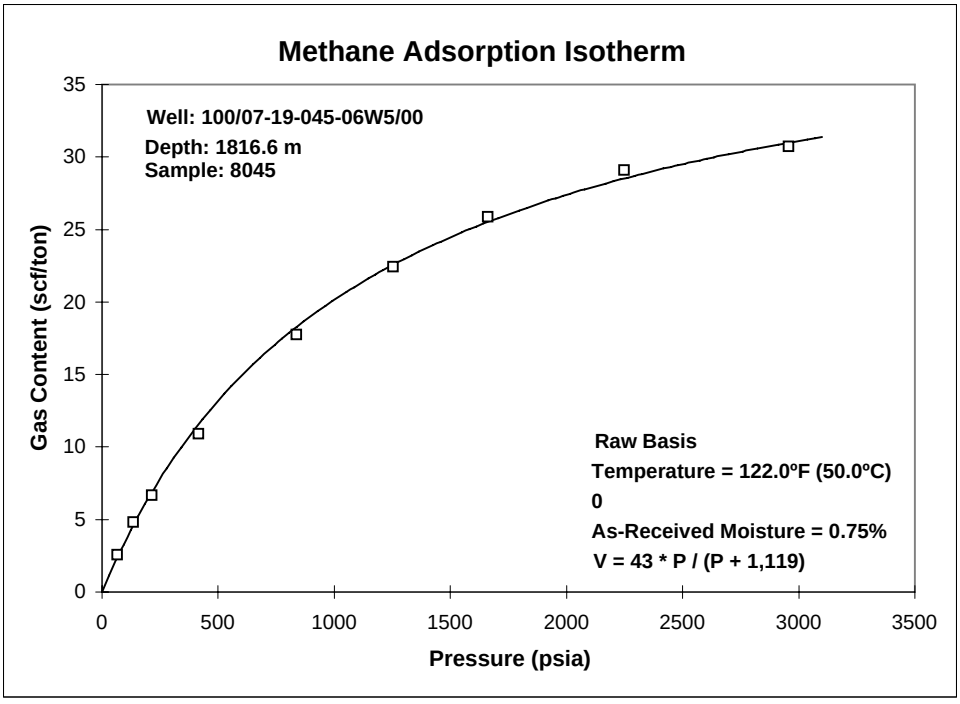
Sample Weight = 235.78 g	
Particle Size = < 12 Mesh	As-Received Moisture = 0.75%
Temperature = 122.0ºF (50.0ºC)	

Methane Adsorption

Pressure		Gas Content (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
65	0.45	2.6	0.08
135	0.93	4.8	0.15
214	1.48	6.6	0.21
416	2.87	10.9	0.34
837	5.77	17.8	0.56
1,255	8.65	22.4	0.70
1,663	11.47	25.9	0.81
2,249	15.51	29.1	0.91
2,957	20.39	30.8	0.96

Langmuir Coefficients **V = 42.7 * P / (P + 1,118.6)**

PL		VL (Raw Basis)	
(psia)	(MPa)	(scf/ton)	(scc/gm)
1,118.6	7.71	42.7	1.3



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Appendix 6 – Colorado Group Rock Eval™ 6 TOC

Legend

Column Label	Label Description
Sample No.	AGS sample number
Sample Type	Outcrop or core sample
Site No.	Site location number
Qty (g)	Sample weight in grams
S1*	Amount of free hydrocarbons (in milligrams of hydrocarbon per gram of rock)
S2*	Amount of hydrocarbons generated through thermal cracking
PI*	Production index, S1/(S1+S2)
S3	Milligrams CO_2 per gram of rock
Max T (°C)	Rock Eval 2 - adjusted temperature of maximum hydrocarbon generation calculated from Peak T
Peak T (°C)	Temperature of maximum hydrocarbon generation from Rock Eval 6
TOC (wt %)	Total organic carbon in weight per cent
HI	Hydrogen index - (100 * S2)/TOC
OI	Oxygen index - (100 * S3)/TOC
MINC (%)	Mineral carbon in weight per cent
nd	No data

* Output rounded to two decimal places.

Sample No.	Sample Type	Site No.	Qty (g)	S1	S2	PI	S3	Max T (°C)	Peak T (°C)	TOC (wt %)	HI	OI	MINC (%)
5746	outcrop	C39	70.7	0.04	1.55	0.03	0.69	417	454	1.07	145	64	0.1
5747	outcrop	C40	70.3	0.02	0.32	0.06	0.94	419	456	1.26	25	75	0.1
5748	outcrop	C41	70.6	0.01	0.20	0.06	0.54	427	464	0.77	26	70	0.1
6825	outcrop	C42	70.6	0.03	0.58	0.04	0.95	423	460	1.35	43	70	0.1
6826	outcrop	C42	70.3	0.03	0.40	0.06	1.38	428	465	1.12	36	123	0.1
6827	outcrop	C42	70.2	0.04	1.56	0.03	2.04	427	464	1.77	88	115	0.2
6901	core	C37	70.2	0.44	15.07	0.03	1.75	416	456	4.71	320	37	0.9
6902	core	C37	70.5	0.11	3.71	0.03	0.52	416	456	1.30	285	40	2.7
6903	core	C37	70.5	0.13	4.11	0.03	0.65	413	453	1.89	217	34	0.6
6904	core	C37	70.6	0.30	12.74	0.02	1.06	412	452	3.64	350	29	0.6
6905	core	C37	70.5	0.30	15.88	0.02	1.01	404	444	5.16	308	20	0.2
6906	core	C37	70.4	0.05	0.97	0.05	0.45	416	456	0.54	180	83	2.7
6916	core	duplicate	70.2	1.76	11.77	0.13	0.12	439	479	3.70	318	3	0.7
7251	outcrop	C44	71.2	0.01	0.18	0.07	0.49	429	466	0.60	30	82	0.1
7252	outcrop	C45	70.7	0.11	0.70	0.13	0.30	464	501	1.51	46	20	0.1
7254	outcrop	C45	70.3	0.09	0.47	0.16	0.34	454	491	0.75	63	45	1.1
7255	outcrop	C45	70.5	0.22	1.47	0.13	0.56	457	494	2.02	73	28	0.4
7256	outcrop	C45	70.8	0.08	0.27	0.23	0.18	456	493	0.91	30	20	0.1
7257	outcrop	C45	70.2	0.18	0.86	0.17	0.56	460	497	1.39	62	40	0.1
7258	outcrop	C45	70.7	0.13	0.42	0.24	0.19	457	494	1.12	38	17	0.3
7259	outcrop	C45	70.7	0.15	0.50	0.23	0.49	454	491	1.19	42	41	0.5
7261	outcrop	C45	70.8	0.15	0.67	0.19	0.09	452	489	1.23	54	7	0.1
7262	outcrop	C45	70.4	0.13	0.75	0.14	0.33	462	499	1.59	47	21	0.1
7263	outcrop	C45	70.7	0.15	1.55	0.09	0.09	456	493	2.01	77	4	0.1
7264	outcrop	C45	70.8	0.15	1.03	0.12	0.11	457	494	1.57	66	7	0.1
7265	outcrop	C45	70.8	0.08	0.72	0.10	0.24	466	503	1.40	51	17	0.1
7266	outcrop	C45	70.5	0.23	0.80	0.22	0.15	457	494	1.29	62	12	0.1
7267	outcrop	C45	70.6	0.22	0.52	0.30	0.48	456	493	0.73	71	66	8.5
7269	outcrop	C45	70.0	0.04	0.26	0.14	0.20	459	496	0.68	38	29	0.1
7270	outcrop	C45	70.4	0.11	0.48	0.19	0.19	456	493	1.30	37	15	0.1
7271	outcrop	C45	70.9	0.14	0.53	0.21	0.19	449	486	1.22	43	16	0.1
7272	outcrop	C45	70.2	0.12	0.51	0.19	0.19	457	494	1.41	36	13	0.1
7273	outcrop	C45	70.8	0.53	1.70	0.24	0.24	453	490	1.87	91	13	0.9
7274	outcrop	C45	70.3	0.48	1.31	0.27	0.46	455	492	1.81	72	25	0.7
7275	outcrop	C45	70.7	0.47	1.65	0.22	0.23	453	490	1.81	91	13	1.0
7276	outcrop	C45	70.9	0.43	1.90	0.19	0.60	455	492	2.10	90	29	0.8
7280	outcrop	C45	70.9	0.38	2.51	0.13	0.29	450	487	2.05	122	14	0.7
7281	outcrop	C45	70.9	0.25	1.57	0.14	0.40	449	486	1.76	89	23	1.0
7282	outcrop	C45	70.1	0.03	0.53	0.05	0.22	447	484	1.18	45	19	0.1
7283	outcrop	C45	71.1	0.02	0.47	0.05	0.31	443	480	0.93	51	33	0.1
7284	outcrop	C45	70.0	0.07	0.97	0.06	0.44	446	483	1.74	56	25	0.8
7285	outcrop	C45	70.6	0.04	0.70	0.05	1.11	446	483	1.55	45	72	0.2
7286	outcrop	C45	70.3	0.04	0.57	0.07	0.38	442	479	1.06	54	36	0.1
7289	core	C22	70.7	1.11	6.57	0.14	0.11	439	479	2.51	262	4	0.3
7290	core	C22	70.0	0.82	5.21	0.14	0.11	442	482	2.01	259	5	0.2
7291	core	C22	70.0	1.68	11.30	0.13	0.14	438	478	3.70	305	4	0.7
7292	core	C22	70.1	1.09	14.15	0.07	0.14	438	478	4.28	331	3	0.6
7293	outcrop	C43	70.1	0.07	4.62	0.02	2.13	418	455	3.12	148	68	0.2
7294	core	C18	70.7	0.17	5.06	0.03	0.50	423	463	2.05	247	24	0.3
7295	core	C18	70.6	0.09	3.01	0.03	0.43	420	460	1.61	187	27	0.1
7296	core	C18	70.8	0.21	10.09	0.02	0.86	400	440	3.74	270	23	0.2
7297	core	C18	70.3	0.10	5.53	0.02	0.68	421	461	2.16	256	31	0.1
7298	core	C18	70.5	0.12	3.31	0.03	0.45	421	461	1.57	211	29	0.1
7299	core	C18	70.8	0.13	5.63	0.02	0.69	419	459	2.09	269	33	0.2
7300	core	C18	70.2	0.04	0.18	0.19	0.15	416	456	0.49	37	31	0.1
7306	outcrop	C44	70.4	0.03	2.91	0.01	1.51	421	458	1.85	157	82	0.2
7315	outcrop	C43	70.0	0.10	13.43	0.01	3.53	410	447	5.42	248	65	0.2
7316	outcrop	C43	70.4	0.13	15.33	0.01	3.07	414	451	4.93	311	62	0.3
7317	outcrop	C43	69.8	0.44	46.31	0.01	3.68	409	446	9.28	499	40	2.4
7318	outcrop	C43	70.4	0.51	30.67	0.02	4.79	405	442	8.54	359	56	0.3
7319	outcrop	C43	50.5	0.54	33.14	0.02	7.40	408	445	10.63	312	70	0.4
7320	outcrop	C43	70.1	0.07	2.97	0.02	5.70	410	447	3.70	80	154	0.7
7322	outcrop	C43	70.0	0.07	4.54	0.02	1.99	416	453	2.80	162	71	0.2
7323	outcrop	C43	70.7	0.08	4.79	0.02	1.86	419	456	2.97	161	63	0.2

Sample No.	Sample Type	Site No.	Qty (g)	S1	S2	PI	S3	Max T (°C)	Peak T (°C)	TOC (wt %)	HI	OI	MINC (%)
7324	outcrop	C43	70.4	0.04	3.08	0.01	1.79	421	458	2.37	130	76	0.2
7325	outcrop	C43	70.9	0.07	4.60	0.02	2.16	415	452	3.06	150	71	0.2
7326	outcrop	C43	70.5	0.02	0.38	0.05	1.18	421	458	1.00	38	118	0.2
7327	outcrop	C43	70.8	0.01	0.11	0.08	1.93	422	459	0.89	12	217	0.2
7328	outcrop	C43	70.8	0.01	0.20	0.06	1.30	436	473	0.88	23	148	0.2
7329	outcrop	C43	70.7	0.03	1.21	0.02	1.04	419	456	0.97	125	107	3.1
7330	outcrop	C44	70.1	0.03	0.53	0.05	1.14	417	454	1.46	36	78	0.2
7331	outcrop	C44	70.1	0.06	3.93	0.02	1.77	417	454	2.54	155	70	0.2
7332	outcrop	C44	70.8	0.03	2.17	0.02	1.24	423	460	2.08	104	60	0.2
7333	outcrop	C44	70.7	0.03	0.61	0.05	1.52	416	453	1.55	39	98	0.3
7334	outcrop	C44	70.7	0.04	1.44	0.03	1.58	418	455	2.10	69	75	0.2
7335	outcrop	C44	70.1	0.02	0.77	0.02	0.73	422	459	0.72	107	101	0.1
7336	outcrop	C44	70.7	0.01	0.08	0.11	0.37	423	460	0.15	53	247	0.1
7337	outcrop	C44	70.0	0.03	0.79	0.03	1.22	422	459	0.95	83	128	0.1
7338	outcrop	C44	70.9	0.04	3.49	0.01	1.08	419	456	1.90	184	57	0.1
7339	outcrop	C44	70.0	0.02	1.03	0.02	0.77	425	462	1.39	74	55	0.1
7340	outcrop	C44	70.9	0.02	0.93	0.02	0.78	425	462	1.39	67	56	0.1
7341	outcrop	C44	70.6	0.02	0.45	0.05	0.93	419	456	1.36	33	68	0.2
7342	outcrop	C44	70.1	0.03	1.00	0.03	0.85	427	464	1.37	73	62	0.1
7343	outcrop	C44	70.7	0.04	0.74	0.05	1.08	421	458	1.81	41	60	0.2
7344	outcrop	C44	70.3	0.02	0.48	0.05	0.96	413	450	1.47	33	65	0.2
7345	outcrop	C44	70.8	0.02	0.62	0.03	0.85	426	463	1.37	45	62	0.1
7346	outcrop	C44	70.2	0.01	0.24	0.05	0.75	421	458	1.01	24	74	0.1
7348	outcrop	C44	70.2	0.01	0.33	0.04	0.65	426	463	0.87	38	75	0.1
7350	outcrop	C44	70.3	0.02	0.27	0.06	0.59	423	460	1.10	25	54	0.1
8023	core	C30	70.5	0.22	3.34	0.06	0.48	430	470	2.01	166	24	0.4
8024	core	C30	70.1	0.28	7.27	0.04	0.75	419	459	2.34	311	32	0.8
8025	core	C38	70.4	0.44	12.52	0.03	0.89	407	447	3.45	363	26	1.6
8026	core	C38	70.2	0.64	14.18	0.04	0.62	416	456	3.90	364	16	0.6
8027	core	C38	70.7	0.35	22.55	0.02	1.08	413	453	5.18	435	21	1.8
8028	core	C38	70.9	0.39	20.37	0.02	0.93	409	449	5.06	403	18	0.4
8029	core	C24	71.0	0.10	6.67	0.02	0.55	416	456	2.75	243	20	0.2
8032	core	C37	70.3	0.14	3.49	0.04	0.50	408	448	2.48	141	20	0.2
8033	core	C37	70.2	0.36	13.94	0.03	0.83	405	445	4.41	316	19	0.1
8034	core	C04	70.0	1.58	7.96	0.17	0.18	442	482	3.20	249	6	1.6
8035	core	C04	70.3	1.72	8.81	0.16	0.19	441	481	3.74	236	5	1.3
8036	core	C36	70.5	0.42	10.41	0.04	0.46	422	462	2.93	355	16	0.9
8037	core	C36	70.3	0.23	3.49	0.06	0.26	421	461	1.65	212	16	0.5
8041	core	C14	nd	0.6	28.96	0.02	1.71	412	nd	5.18	559	33	nd
8042	core	C11	nd	1.09	3.71	0.23	0.51	441	nd	1.75	212	29	nd
8043	core	C34	nd	0.81	1.07	0.43	0.54	453	nd	1.73	62	31	nd
8044	core	C34	nd	1.4	2.06	0.4	0.55	455	nd	3.2	64	17	nd
8045	core	C20	nd	1.95	5	0.28	0.53	449	nd	2.92	171	18	nd
8501	core	C01	70.9	1.33	22.44	0.06	0.51	421	461	5.03	446	10	2.1
8502	core	C01	70.6	0.99	19.09	0.05	0.31	424	464	4.15	460	7	0.8
8503	core	C01	70.4	0.73	16.35	0.04	0.24	424	464	3.69	443	7	0.2
8505	core	C01	70.2	0.40	4.53	0.08	0.17	430	470	1.52	298	11	0.5
8506	core	C01	70.5	0.30	4.72	0.06	0.10	437	477	1.48	319	7	0.1
8507	core	C13	70.2	0.15	1.18	0.11	0.10	447	487	1.12	105	9	0.3
8508	core	C13	70.3	0.34	1.69	0.17	0.10	443	483	1.42	119	7	0.3
8509	core	C13	70.4	0.26	1.08	0.19	0.07	445	485	1.07	101	7	0.2
8510	core	C13	70.0	0.19	1.09	0.15	0.07	443	483	1.06	103	7	0.2
8511	core	C13	70.2	0.16	1.01	0.13	0.08	443	483	1.11	91	7	0.2
8512	core	C13	70.7	0.41	1.76	0.19	0.07	445	485	1.34	131	5	0.1
8513	core	C30	70.9	0.09	0.68	0.11	0.21	429	469	1.02	67	21	0.5
8514	core	C30	70.2	0.17	3.14	0.05	0.35	421	461	1.73	182	20	0.5
8515	core	C30	70.3	0.19	7.32	0.03	0.82	418	458	2.64	277	31	0.8
8516	core	C30	70.4	0.47	8.45	0.05	0.76	416	456	2.82	300	27	0.7
8517	core	C35	70.5	0.19	6.24	0.03	1.24	421	461	2.15	290	58	0.9
8518	core	C35	70.4	0.04	0.74	0.05	0.44	420	460	0.40	185	110	2.9
8519	core	C35	70.3	0.32	10.14	0.03	1.28	414	454	3.06	331	42	1.1
8520	core	C35	70.9	0.37	8.70	0.04	0.86	412	452	2.82	309	30	0.6
8521	core	C14	70.3	0.25	16.39	0.01	1.32	416	456	4.40	372	30	0.4
8522	core	C14	70.2	0.13	10.47	0.01	0.92	416	456	2.61	401	35	2.7

Sample No.	Sample Type	Site No.	Qty (g)	S1	S2	PI	S3	Max T (°C)	Peak T (°C)	TOC (wt %)	HI	OI	MINC (%)
8523	core	C14	70.3	0.19	12.31	0.01	1.34	413	453	3.28	375	41	3.7
8524	core	C14	70.2	0.25	20.08	0.01	1.91	411	451	4.80	418	40	2.3
8525	core	C14	70.4	0.29	22.63	0.01	1.77	407	447	4.85	467	36	6.2
8526	core	C14	70.6	0.58	32.38	0.02	2.18	410	450	6.64	488	33	3.9
8527	core	C14	70.1	0.56	39.72	0.01	2.27	408	448	8.15	487	28	1.4
8528	core	C14	70.5	0.54	38.52	0.01	2.56	410	450	7.51	513	34	4.9
8529	core	C09	70.5	0.12	4.61	0.02	0.52	422	462	1.68	274	31	0.1
8530	core	C09	70.3	0.08	4.09	0.02	0.47	422	462	1.50	273	31	0.1
8531	core	C05	70.6	0.99	8.05	0.11	1.36	416	456	3.02	267	45	1.5
8532	core	C05	70.2	0.91	9.09	0.09	1.49	418	458	3.34	272	45	1.1
8533	core	C05	69.9	0.52	4.64	0.10	0.84	421	461	2.20	211	38	0.6
8534	core	C05	70.6	0.42	6.43	0.06	1.07	420	460	2.65	243	40	0.9
8535	core	C15	70.8	0.36	17.50	0.02	0.45	435	475	3.62	483	12	0.1
8536	core	C15	70.4	0.29	4.32	0.06	0.62	411	451	2.65	163	23	0.3
8537	core	C15	70.6	0.52	3.58	0.13	0.41	419	459	1.13	317	36	1.1
8538	core	C15	70.3	0.72	6.68	0.10	0.32	426	466	2.26	296	14	0.2
8539	core	C15	70.4	0.37	1.66	0.18	0.48	424	464	1.34	124	36	1.8
8540	core	C07	71.0	0.31	8.31	0.04	0.68	415	455	2.14	388	32	0.3
8541	core	C07	70.3	0.13	5.72	0.02	0.57	418	458	1.50	381	38	1.1
8542	core	C17	70.5	0.81	8.77	0.08	1.03	421	461	2.62	335	39	0.4
8543	core	C17	70.2	0.26	5.44	0.05	0.93	423	463	1.97	276	47	0.3
8544	core	C17	70.1	0.26	13.42	0.02	1.12	407	447	4.01	335	28	0.5
8545	core	C31	70.9	0.69	7.03	0.09	1.07	418	458	2.60	270	41	2.9
8546	core	C31	70.2	0.24	2.39	0.09	0.56	432	472	1.59	150	35	0.2
8547	core	C31	70.8	0.23	2.59	0.08	0.60	429	469	1.74	149	34	0.4
8548	core	C25	70.4	0.17	6.97	0.02	0.55	421	461	2.26	308	24	0.2
8549	core	C25	70.7	0.37	14.44	0.03	1.31	414	454	3.31	436	40	1.7
8550	core	C25	70.4	0.05	1.69	0.03	0.22	413	453	0.92	184	24	0.1
8551	core	C25	70.3	0.09	2.93	0.03	0.25	417	457	1.05	279	24	0.2
8552	core	C25	70.1	0.05	0.47	0.09	0.22	415	455	0.43	109	51	0.1
8553	core	C25	70.4	0.08	1.24	0.06	0.20	422	462	0.69	180	29	0.2
8554	core	C21	70.6	0.11	2.90	0.04	0.20	440	480	1.62	179	12	0.1
8555	core	C21	70.5	0.15	3.34	0.04	0.18	440	480	1.62	206	11	0.1
8556	core	C16	70.9	1.31	2.30	0.36	0.24	416	456	1.28	180	19	0.1
8557	core	C16	70.6	0.83	2.12	0.28	0.19	420	460	0.96	221	20	0.1
8558	core	C16	70.3	3.20	4.51	0.42	0.32	413	453	1.64	275	20	0.1
8559	core	C16	70.6	5.22	21.53	0.20	1.34	408	448	6.57	328	20	0.2
8560	core	C16	70.1	2.45	10.27	0.19	0.78	411	451	3.80	270	21	0.1
8561	core	C16	70.8	1.41	9.59	0.13	0.64	423	463	3.08	311	21	0.1
8562	core	C29	70.8	0.61	22.14	0.03	0.79	419	459	4.76	465	17	0.6
8563	core	C29	70.4	1.02	27.54	0.04	0.79	415	455	5.80	475	14	0.7
8564	core	C29	70.8	0.36	9.47	0.04	0.53	416	456	2.43	390	22	1.4
8565	core	C29	70.7	0.54	10.56	0.05	0.68	416	456	2.68	394	25	3.5
8566	core	C27	70.1	0.57	26.22	0.02	1.41	410	450	5.37	488	26	0.3
8567	core	C27	71.0	0.16	4.90	0.03	0.37	416	456	1.95	251	19	0.1
8568	core	C27	70.7	0.06	2.00	0.03	0.31	421	461	1.36	147	23	0.1
8569	core	C27	70.4	0.15	4.00	0.04	0.46	426	466	1.77	226	26	0.1
8570	core	C27	70.8	0.40	20.78	0.02	0.94	406	446	5.89	353	16	0.1
8571	core	C27	70.7	0.05	0.42	0.12	0.13	427	467	0.68	62	19	0.0
8572	core	C27	70.1	0.07	0.30	0.20	0.09	409	449	0.38	79	24	0.0
8573	core	C27	70.3	0.41	0.35	0.54	0.13	419	459	0.49	71	27	0.1
8574	core	C27	70.3	0.05	0.19	0.21	0.55	418	458	0.39	49	141	1.5
8575	core	C10	71.0	0.47	11.60	0.04	1.11	413	453	4.05	286	27	0.4
8576	core	C10	70.7	0.28	10.40	0.03	1.12	407	447	3.87	269	29	0.4
8577	core	C10	70.5	0.62	27.77	0.02	1.80	409	449	5.63	493	32	3.8
8578	core	C10	70.5	0.47	6.32	0.07	1.33	422	462	2.72	232	49	1.3
8579	core	C10	70.1	0.43	11.60	0.04	0.99	408	448	3.81	304	26	0.5
8580	core	C10	70.7	0.36	4.06	0.08	0.56	413	453	1.84	221	30	0.6
8581	core	C08	70.6	0.18	6.44	0.03	0.67	415	455	2.51	257	27	0.6
8582	core	C08	70.9	0.29	7.15	0.04	0.72	418	458	2.69	266	27	1.0
8583	core	C08	70.2	0.16	2.78	0.06	0.57	419	459	1.91	146	30	0.7
8584	core	C08	70.5	0.07	0.85	0.08	0.18	419	459	0.64	133	28	0.7
8585	core	C08	70.2	0.16	2.94	0.05	0.35	414	454	1.39	212	25	0.6
8586	core	C08	70.9	0.24	5.40	0.04	0.57	414	454	2.41	224	24	0.4

Sample No.	Sample Type	Site No.	Qty (g)	S1	S2	PI	S3	Max T (°C)	Peak T (°C)	TOC (wt %)	HI	OI	MINC (%)
8587	core	C08	70.7	0.25	0.70	0.26	0.19	424	464	0.62	113	31	0.6
8588	core	C08	70.9	0.32	3.94	0.07	0.46	419	459	2.03	194	23	0.6
8589	core	C08	70.4	0.45	9.67	0.04	0.66	414	454	3.20	302	21	0.4
8590	core	C08	70.3	0.10	2.31	0.04	0.33	420	460	1.32	175	25	0.4
8591	core	C08	70.2	0.55	10.12	0.05	0.71	412	452	3.37	300	21	0.5
8592	core	C08	70.1	0.15	1.70	0.08	0.43	422	462	1.72	99	25	0.5
8593	core	C08	70.6	0.33	3.14	0.09	0.38	421	461	1.72	183	22	0.3
8594	core	C08	70.4	0.26	3.06	0.08	0.35	424	464	1.81	169	19	0.2
8595	core	C08	70.5	0.13	1.38	0.08	0.31	425	465	1.23	112	25	0.5
8596	core	C33	70.0	0.19	1.77	0.10	0.31	426	466	1.36	130	23	0.2
8597	core	C33	70.7	0.19	9.89	0.02	1.18	414	454	3.66	270	32	0.8
8598	core	C33	70.8	0.07	3.50	0.02	0.50	410	450	1.67	210	30	0.6
8599	core	C33	70.6	0.22	2.05	0.10	0.35	420	460	1.37	150	26	0.6
8600	core	C33	70.3	0.79	6.76	0.11	0.54	416	456	2.50	270	22	0.6
8601	core	C33	70.7	0.46	19.11	0.02	0.98	416	456	4.60	415	21	1.7
8602	core	C33	70.7	0.32	14.21	0.02	0.77	416	456	3.74	380	21	1.5
8603	core	C33	70.7	0.37	6.17	0.06	0.48	416	456	1.97	313	24	1.9
8604	core	C33	70.4	0.22	4.64	0.04	0.35	419	459	1.63	285	21	1.2
8605	core	C33	70.2	0.51	9.39	0.05	0.76	415	455	2.74	343	28	1.8
8606	core	C11	70.6	1.67	6.58	0.20	0.14	440	480	2.94	224	5	0.6
8607	core	C11	70.5	1.10	4.87	0.18	0.14	437	477	2.49	196	6	0.9
8608	core	C11	70.2	1.55	6.46	0.19	0.09	439	479	2.96	218	3	0.5
8609	core	C11	70.8	1.50	6.00	0.20	0.16	439	479	2.97	202	5	0.6
8610	core	C11	70.4	0.18	1.33	0.12	0.13	444	484	1.08	123	12	0.2
8611	core	C11	70.5	0.21	1.85	0.10	0.14	442	482	1.50	123	9	0.3
8612	core	C11	70.3	0.19	2.06	0.08	0.09	446	486	1.42	145	6	0.2
8613	core	C12	70.3	0.26	0.94	0.22	0.12	446	486	1.01	93	12	0.2
8614	core	C12	70.4	0.15	0.79	0.15	0.08	448	488	1.06	75	8	0.1
8615	core	C34	70.5	0.99	1.72	0.37	0.11	447	487	1.85	93	6	0.4
8616	core	C34	70.6	0.88	1.70	0.34	0.12	446	486	1.97	86	6	0.2
8617	core	C34	70.7	1.04	1.70	0.38	0.12	449	489	1.93	88	6	0.4
8618	core	C34	70.1	1.33	2.18	0.38	0.27	452	492	3.40	64	8	0.5
8619	core	C34	70.0	1.28	2.40	0.35	0.23	454	494	3.08	78	7	0.7
8620	core	C26	70.4	0.99	20.44	0.05	3.04	398	438	6.75	303	45	0.5
8621	core	C26	70.5	1.28	19.56	0.06	2.02	411	451	5.24	373	39	0.3
8622	core	C26	70.0	0.11	0.67	0.14	3.37	432	472	1.35	50	250	0.9
8623	core	C26	70.2	0.24	0.78	0.23	0.59	432	472	1.26	62	47	0.1
8624	core	C26	70.7	0.07	0.51	0.12	0.92	437	477	1.05	49	88	0.2
8625	core	C26	70.6	0.16	0.84	0.16	0.92	432	472	1.40	60	66	0.3
8626	core	C26	69.9	0.29	1.43	0.17	0.99	434	474	1.66	86	60	0.3
8627	core	C03	70.5	0.16	0.93	0.14	0.75	432	472	1.50	62	50	0.2
8628	core	C03	70.4	0.14	1.70	0.07	0.80	432	472	1.72	99	47	0.1
8629	core	C03	70.6	0.17	0.97	0.15	0.69	431	471	1.50	65	46	0.1
8630	core	C03	70.4	0.18	1.85	0.09	0.62	430	470	1.39	133	45	0.1
8631	core	C03	70.1	0.18	1.63	0.10	0.85	433	473	1.94	84	44	0.1
8632	core	C03	70.7	0.13	1.63	0.07	0.99	414	454	2.17	75	46	0.2
8633	core	C32	70.1	0.06	0.72	0.08	0.42	441	481	1.01	71	42	0.8
8634	core	C32	70.4	0.28	1.83	0.13	0.12	441	481	1.40	131	9	0.2
8635	core	C32	70.3	0.28	3.01	0.09	0.15	443	483	1.97	153	8	0.1
8636	core	C32	70.5	0.34	1.20	0.22	0.46	439	479	1.26	95	37	0.7
8637	core	C28	70.1	1.36	4.87	0.22	0.18	448	488	3.37	145	5	1.1
8638	core	C28	70.2	1.29	5.45	0.19	0.17	448	488	3.36	162	5	1.5
8639	core	C28	70.4	0.79	2.55	0.24	0.10	445	485	2.13	120	5	0.6
8640	core	C28	70.7	0.82	2.11	0.28	0.07	451	491	1.66	127	4	0.2
8641	core	C19	71.0	0.13	0.48	0.22	0.08	474	514	1.24	39	6	0.1
8642	core	C19	70.4	0.25	0.86	0.22	0.06	481	521	1.54	56	4	0.3
8643	core	C19	70.0	0.19	0.77	0.20	0.12	481	521	1.39	55	9	0.5
8644	core	C06	70.7	0.35	1.05	0.25	0.21	441	481	1.10	95	19	0.4
8645	core	C06	70.4	0.09	0.75	0.11	0.26	444	484	1.08	69	24	0.5
8646	core	C06	70.4	0.07	0.94	0.07	0.14	445	485	1.01	93	14	0.2
8647	core	C06	70.3	0.19	1.38	0.12	0.16	442	482	1.22	113	13	0.2
8648	core	C20	70.8	1.50	5.27	0.22	0.21	447	487	3.02	175	7	2.0
8649	core	C20	70.6	1.47	4.70	0.24	0.17	446	486	2.58	182	7	2.3
8650	core	C20	70.1	1.30	4.39	0.23	0.20	448	488	2.53	174	8	1.7

Sample No.	Sample Type	Site No.	Qty (g)	S1	S2	PI	S3	Max T (°C)	Peak T (°C)	TOC (wt %)	HI	OI	MINC (%)
8651	core	C20	70.6	1.56	5.19	0.23	0.23	448	488	3.05	170	8	2.3
8652	core	C20	70.3	2.01	6.69	0.23	0.25	447	487	3.95	169	6	2.3
8653	core	C20	70.3	2.23	6.27	0.26	0.15	448	488	3.61	174	4	0.6
8654	core	C20	70.3	0.64	1.90	0.25	0.11	446	486	1.66	114	7	0.4
8655	core	C20	70.3	0.73	1.93	0.27	0.10	447	487	1.66	116	6	0.5
8656	core	C20	70.4	0.83	2.53	0.25	0.15	446	486	2.00	126	8	0.5
8657	core	C20	70.2	1.25	3.85	0.25	0.14	446	486	2.55	151	5	0.8
8658	core	C20	70.1	1.98	5.38	0.27	0.29	442	482	3.11	173	9	6.0
8659	core	C20	70.5	2.71	8.21	0.25	0.27	445	485	4.92	167	5	1.4
8660	core	C20	70.7	1.91	5.40	0.26	0.16	446	486	3.25	166	5	0.9
8661	core	C20	70.6	2.45	6.87	0.26	0.23	443	483	4.25	162	5	1.2
8662	core	C20	70.2	1.71	5.76	0.23	0.12	447	487	3.18	181	4	0.2
8663	core	C20	70.2	1.92	4.95	0.28	0.11	446	486	2.87	172	4	0.2
8664	core	C23	70.7	0.16	6.49	0.02	0.45	414	454	2.96	219	15	0.2
8665	core	C23	70.8	0.22	11.22	0.02	0.39	419	459	3.00	374	13	0.2
8666	core	C23	70.0	0.05	0.92	0.06	0.18	419	459	1.22	75	15	0.1
8667	core	C23	70.2	0.07	1.44	0.04	0.15	422	462	1.25	115	12	0.1
8668	core	C02	70.6	0.20	0.83	0.19	0.10	455	495	1.16	72	9	0.1
8669	core	C02	70.3	0.55	1.45	0.28	1.12	458	498	1.87	78	60	0.8
8670	core	C02	70.5	0.20	1.20	0.14	0.12	450	490	0.97	124	12	0.1
8671	core	C02	70.2	0.87	4.84	0.15	0.13	461	501	3.37	144	4	0.1
8672	core	duplicate	70.8	1.13	18.99	0.06	0.26	423	463	4.48	424	6	0.5
8673	core	duplicate	70.4	0.48	1.45	0.25	0.07	443	483	1.21	120	6	0.2
8674	core	duplicate	70.2	0.12	2.11	0.05	0.20	422	462	0.97	218	21	1.4
8675	core	duplicate	70.3	0.48	17.48	0.03	0.74	419	459	4.08	428	18	0.5
8676	core	duplicate	70.5	0.25	3.00	0.08	0.37	422	462	1.67	180	22	0.4
8677	core	duplicate	70.3	0.15	0.74	0.17	0.37	442	482	0.96	77	39	0.7
GSC	standard	standard	70.3	0.72	12.40	0.05	0.50	444	481	5.03	247	10	4.3
GSC	standard	standard	70.4	0.72	12.18	0.06	0.55	442	479	5.04	242	11	4.3
GSC	standard	standard	70.2	0.69	12.21	0.05	0.51	443	480	5.07	241	10	4.5
GSC	standard	standard	70.6	0.72	12.41	0.05	0.55	444	481	5.01	248	11	4.3
GSC	standard	standard	70.6	0.73	12.31	0.06	0.51	444	481	5.03	245	10	4.3
GSC	standard	standard	70.4	0.73	12.20	0.06	0.50	444	481	5.07	241	10	4.4
GSC	standard	standard	70.0	0.16	12.55	0.01	0.80	418	455	3.30	380	24	3.4
GSC	standard	standard	70.3	0.73	12.30	0.06	0.54	442	479	5.05	244	11	4.3
GSC	standard	standard	70.6	0.73	11.96	0.06	0.55	443	480	5.05	237	11	4.3
GSC	standard	standard	70.6	0.74	12.23	0.06	0.53	443	480	5.09	240	10	4.4
GSC	standard	standard	70.7	0.74	12.40	0.06	0.56	443	480	5.08	244	11	4.5
GSC	standard	standard	70.4	0.74	12.35	0.06	0.56	443	480	5.03	246	11	4.3
GSC	standard	standard	70.1	0.73	12.38	0.06	0.54	443	480	5.05	245	11	4.4
GSC	standard	standard	70.2	0.73	12.35	0.06	0.53	445	482	5.05	245	10	4.3
GSC	standard	standard	70.1	0.75	12.34	0.06	0.55	443	480	5.06	244	11	4.3
GSC	standard	standard	70.8	0.73	12.32	0.06	0.52	444	481	5.02	245	10	4.3
GSC	standard	standard	70.3	0.73	12.27	0.06	0.54	445	482	5.02	244	11	4.4
GSC	standard	standard	70.8	0.74	12.27	0.06	0.50	443	480	5.03	244	10	4.3
GSC	standard	standard	70.8	0.73	12.40	0.06	0.56	443	480	5.03	247	11	4.3
GSC	standard	standard	70.5	0.74	12.24	0.06	0.57	444	481	5.08	241	11	4.4
GSC	standard	standard	70.9	0.73	12.25	0.06	0.55	443	480	5.05	243	11	4.4
GSC	standard	standard	70.6	0.73	12.34	0.06	0.55	443	480	5.08	243	11	4.4
GSC	standard	standard	70.7	0.72	11.87	0.06	0.57	442	480	5.12	232	11	4.4

Description and Reflectance (Maturation)

Legend

Column Label	Label Description
Sample No.	AGS sample number
Photo No.	Photo number of sample
Organic Type	Kerogen type (I to IV)
Vitrinite Reflectance ($\%_R$)	Per cent random reflectance in oil
Standard Deviation	Standard deviation
n	Number of individual measurements
Comments	Sample observations

Organic Type

2	Vitrinite %Ro
2.1,2.2,2.3	Refers to reworked population
3	Vitrinite equivalent = 0.618*bitumen %Ro + 0.40
4	Bitumen
31	Isotropic low %Ro secondary bitumen (derived from secondary bitumen)
32	Isotropic high %Ro secondary bitumen (typically derived from 31)

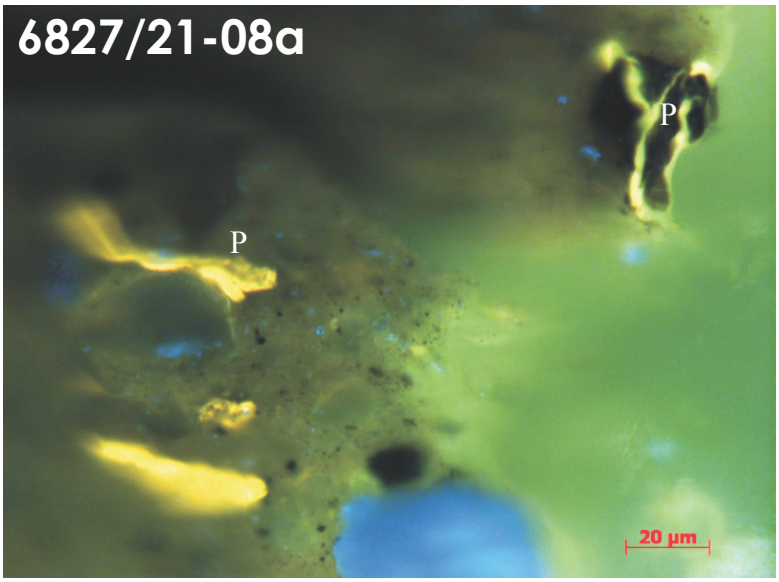
Sample No.	Photo No.	Organic Type	Vitrinite Reflectance ($\%_R$)	Standard Deviation	n	Comments
6827	**21-08**	2	0.555	0.070	9	Organically rich shale with mostly yellow-fluorescing Prasinophyte alginite (P). Rare, yellow-fluorescing canthomorphic acritarchs (ac) and Tasmanites-like alginite were also observed High amount of reworked coaly fragment with high %Ro (vitrinite reflection).
		2.2	0.810	0.077	15	
		2.2	1.034	0.076	11	
6905	**93-08**	2	0.459	0.063	12	Liptinite and pyrite (py)-rich shale, consisting mostly of yellow to brown-fluorescing fluoramorphinite-matrix bituminite (F) lenses with yellow to dull yellow-fluorescing alginite and liptodetrinite (lp) inclusion, yellow-fluorescing Prasinophyte (P) and thick-walled Tasmanites-like (T) alginite, and orange-fluorescing, solid bitumen (B). Rare reworked organic matter. Fluorescent and reflected white light.
		2.2	0.642	0.021	5	
		4	0.258	0.048	2	
		2.2	1.150		1	
7264	**22-08**	2	0.603	0.090	14	Organically lean shale with mostly with mostly reworked organic matter. Some yellow-fluorescing Prasinophyte alginite and rare Leiosphaeridia-like alginite. The sample is also partially oxidized. Some quartz particles contain hydrocarbon fluid-inclusions (hcfi). Fluorescence and white light.
		2.2	0.849	0.068	11	
		2.2	1.138	0.078	10	
		2.2	1.440		1	
7267	**23-08**	4	1.037	0.100	32	Shale/carbonate with some weakly fluorescing, solid primary bitumen brecciated within shale and carbonate matrices. Some high-reflecting, solid migrabitumen in pores and fractures were also observed. Fluorescent and white light.
		32	1.381	0.072	14	
		32	1.637	0.032	4	
		2.1	0.719	0.016	4	
7275	**24-08**	2	0.825	0.098	6	**No Photos.** Reworked sediments with high degree of degradation due to oxidation. Mostly reworked vitrinite and inertodetrinite macerals.
		2.2	1.120	0.087	12	
		2.2	1.532	0.122	10	
		2.2	2.020		1	
7292	**92-08**	2	0.760	0.107	26	Liptinite and pyrite (py)-rich shale, consisting mostly of yellow-fluorescing Prasinophyte alginite (P). Also noted are weakly fluorescing fluoramorphinite (F), orange-fluorescing, solid bitumen (B) rare, yellow-fluorescing sporinite, yellow-fluorescing hydrocarbon fluid-inclusion (hcfi) annealed to and within quartz microfractures, and reworked inertinite maceral. Fluorescence and reflected white light.
		4	0.468	0.059	11	
		2.2	1.218	0.164	5	
		2.2	2.640		1	
7293	**25-08**	2	0.673	0.08	4	Liptinite-rich shale with mostly thin-walled, yellow-fluorescing Prasinophyte alginite (P), including rare, vitrinitized, thick-walled Tasmanites alginite (T). Also observed are yellow-fluorescing Hystricosphaeridium cf. or Multiplicisphaeridium cf. acanthomorphic acritarchs and thick lenses of fluoramorphinite matrix with yellow-fluorescing liptodetrinite inclusions. Fluorescent and white light.
		4	0.414	0.034	4	
		4	0.283	0.024	3	Fluorescing bitumen
7296	**90-08**	2?	0.709	0.138	14	**No photos.** Organic and pyrite-rich shale with high concentration of low-reflecting, nonfluorescing, fluorescing and soluble solid bitumen (B), weakly fluorescing fluoramorphinite-matrix bituminite (F) with orange-fluorescing alginite (mostly Prasinophyte). Oil is released from solid bitumen when viewed under UV light.
		4	0.195	0.048	17	Suppressed %Ro
		2.2	1.016	0.075	8	
		2.2	1.725	0.384	3	
7297	**91-08**	2	0.549	0.047	5	Similar to 7296/90-08. Contains yellow to dull yellow-fluorescing alginite (A), possibly thin-walled Leiosphaeridia) and yellow-fluorescing acanthomorphic arcitarch (ac), possibly Multiplicisphaeridium cf.). High concentration of reworked organic matter (coaly fragment, vitrinite and inertinite). Fluorescent and reflected white light.
		2?	0.736	0.059	5	
		2.2	0.968	0.023	5	
			1.327	0.095	7	
7317	**06-08**	2	0.551	0.090	9	Liptinite and pyrite (framboidal)-rich lime-shale, with mostly yellow-fluorescing alginite (thick-walled Tasmanites (T), Prasinophytes (P) and cocoidal alginite) and yellow-orange– fluorescing solid bitumen (B). Concentration of fluoroamorphinite with inclusions of yellow-fluorescing alginite. Yellow-fluorescing silicoflagellate were also observed. Fluorescent and white light.
		2.3	0.932	0.038	2	
		2.2	0.330		1	
7319	**07-08**	2	0.586	0.075	21	Liptinite and pyrite (framboidal)-rich lime-shale, with mostly yellow-fluorescing Prasinophytes (P) and some cocoidal alginite. High percentage of orange-fluorescing solid bitumen (B). Fluoramorphinite matrix with yellow-fluorescing alginite inclusions was also observed. Fluorescent and white light.

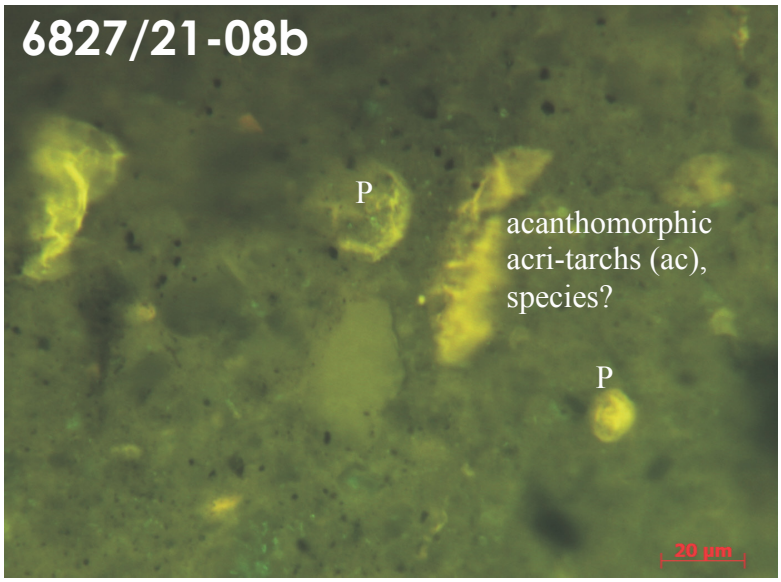
Sample No.	Photo No.	Organic Type	Vitrinite Reflectance ($\%_R$)	Standard Deviation	n	Comments
		2.2	0.759	0.046	8	
		2.2	0.954	0.084	10	
		4	0.262	0.033	3	Fluorescing bitumenite
7329	**08-08**	2	0.577	0.025	6	Bitumen-rich, bone-bed shale with high amount of both epigenitic (pyrite crystal) and syngenetic pyrite. Mostly yellow to orange-fluorescing bitumen, some contain high pyrite inclusions. Small amounts of alginite, mostly associated to silty shale brecciated between a carbonate matrix.
		2.2	1.075	0.05	4	
		2.2	1.759095	0.231513831	2	
		4	0.333	0.075	8	Bitumen, some are fluorescing
7330	**09-08**	2	0.665	0.081	12	Organically lean, silty shale with very small amounts of liptinite, Prasinophytes and rare cocoidal alginite. Fluorescent light.
		2.2	0.438	0.054	2	
		2.2	0.869	0.074	4	
		2.2				
7338	**10-08**	3	0.560	0.086	25	Liptinite-rich, shaley sandstone consisting mostly of yellow-fluorescing Prasinophyte alginite and some aconthomorphic acritarchs. Some lenses of fluoramorphinite with inclusions of yellow-fluorescing alginite were also observed (no image taken). Fluorescent light.
		2.2	0.825	0.071	7	
		2.2	1.074	0.071	2	
7343	**11-08**	2	0.631	0.079	10	Liptinite-rich mudstone consisting mostly of golden yellow-fluorescing Prasinophyte alginite and some acanthomorphic acritarchs.
		2.2	0.833	0.010	3	
		2.2	0.976	0.025	2	
		2.2	1.190		1	
8024	**63-08**	2	0.421	0.045	12	Pyrite-rich shale with lenses of weak yellow to orange-fluorescing fluoramorphinite (F) with yellow-fluorescing alginite (mostly Prasinophyte (P) and liptodetrinite) inclusion, weak orange-fluorescing bitumen (B) and bright yellow-fluorescing bitumen. Also contains reworked vitrinite and inertinite (I) maceral. Fluorescent and reflected white light.
		2.2	0.626	0.054	9	
		2.2	0.854	0.075	6	
		2.2	1.040		1	
8024	**64-08**	2	0.493	0.022	4	Shale with mostly yellow-fluorescing Prasinophyte (P). Most vitrinite (V) are derived from indigenous alginite and reworked small coaly maceral. Also present are amorphous bitumen (B) with micrinite inclusion. Am = amorphous kerogen.
		2.2	0.692	0.046	4	
		2.2	1.041	0.069	3	
		2.2	1.250		1	
8026	**65-08**	2	0.415	0.028	24	Shale rich in weak orange-fluorescing bituminite (B) with bright yellow-fluorescing liptodetrinite inclusion and grey granular bitumen with pyrite (py) and micrinite (mc) inclusion. Yellow- fluorescing alginite consisting mostly of Prasinophyte (P) and rare thick-walled Tasmanites (T) were also observed. Fluorescing acanthomorphic marine acritarch (ac) and chitinous (ch) fossils. Fluorescent and reflected white light. am = amorphous kerogen. Contains reworked inertinite maceral.
		2.2	0.612	0.087	17	
8026		2.2	0.886	0.056	2	
		2.1	0.260		1	
8029	**66-08**	2	0.536	0.078	15	Shale rich in pyrite-fluorescing fluoramophinite-matrix (F) bituminite with bright yellow-fluorescing liptodetrinite. Also rich in yellow-fluorescing alginite consisting mostly of Prasinophyte (P), Tasmanites (T) with some acanthomorphic marine acritarch (ac). Chitinous fossils were observed. Reworked inertinite (I, fusinite) showing cellular wall structure were also observed. Fluorescent and reflected white light.
		4	0.298	0.028	2	
		2.2	0.784	0.051	6	
		2.2	1.000	0.050	6	
		2.2	1.250	0.08	1	
8033	**67-08**	2	0.521	0.102	5	Pyrite-rich shale with fluorescing bituminite and fluoramophinite with yellow-fluorescing liptodetrinite. Rich in yellow-fluorescing alginite consisting mostly of Prasinophyte with some acanthomorphic marine acritarch. Chitinous fossils were observed. Contains reworked inertinite maceral.
		4	0.230			
8035	**69-08**	2	0.652	0.079	25	Liptinite-rich shale consisting mostly granular, grey, nonfluorescing hebamorphinite-like kerogen and golden to dull yellow-fluorescing Prasinophyte alginite. Fluorescent light.
		2.2	0.994	0.097	18	
		2.2	1.271	0.043	8	
8036	**70-08**	2	0.561	0.062	22	Liptinite-rich shale consisting mostly of amorphous kerogen (am) with some yellow-fluorescing Prasinophyte alginite (P), nonfluorescing solid bitumen (B) with brightly fluorescing bitumen. Some weakly fluorescing fluoramorphinite (F) with yellow-fluorescing alginite inclusion. Weakly fluorescing bituminite associated with pyrite and solid bitumen were also observed.
		4	0.388	0.056	15	
		2.2	0.832	0.070	11	
		2.2	1.050	0.068	2	

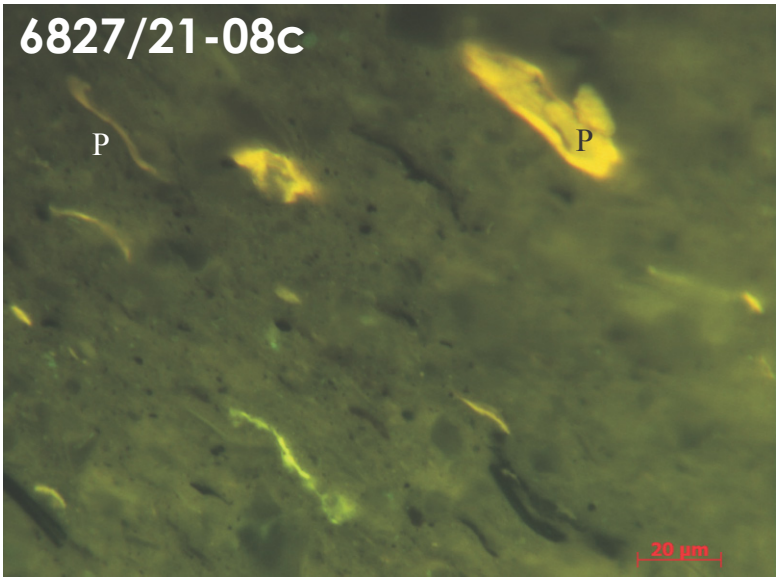
Sample No.	Photo No.	Organic Type	Vitrinite Reflectance ($\%_R$)	Standard Deviation	n	Comments
8501	**71-08**	2	0.426	0.073	12	Pyrite and liptinite-rich shale. Mostly weakly fluorescing fluoramorphinite-matrix (F) bituminite with yellow-fluorescing Prasinophyte alginite (P) and liptodetrinite inclusion. Lenses of amorphous kerogen (am), chitinous microfossils (cf) derived from crustacean or chitinozoans, and solid bitumen (B) were also observed.
		2.2	0.757	0.099	27	
		2.2	1.046	0.032	5	
		2.2	1.270		1.04236	
8527	**72-08**	2	0.397	0.049	17	Pyrite-rich shale with high amounts of interconnected networks of nonfluorescing and fluorescing hebamorphinite and fluoramorphinite-matrix bituminite (F) with numerous inclusions of yellow-fluorescing alginite (mainly Prasinophyte (P) and rare thick-walled Tasmanites (T) and microforams (mf)), and fluorescing to nonfluorescing globules of solid bitumen (B) (some are dissolved under UV light, viewed parallel and perpendicular to the bedding). Fluorescence and reflected white light.
		2.2	0.622	0.077	11	
		4	0.280	0.000	2	
		2.2	0.898	0.059	4	1.170
8544	**73-08**	2	0.372	0.021	2	Pyrite rich shale with some lenses of fluorescing and non-fluorescing fluoramorphinite-matrix bituminite (F) with yellow fluorescing alginite inclusions (mainly Prasinophyte (P) and Leiosphaeridia) and weak fluorescing, low reflecting solid bitumen (B). Some yellow fluorescing spiny acritarch (ac) and possibly dinoflagellates (df) were also observed.
		4	0.270		1	
		2.2	0.686	0.120	6	
		2.2	0.956	0.030	3	
8577	**74-08**	2	0.456	0.079	24	Pyrite-rich shale with some lenses of fluorescing fluoramorphinite-matrix bituminite (F) with yellow-fluorescing alginite inclusions (mainly Prasinophyte (P) and rare Tasmanites (T)) and weakly fluorescing, low-reflecting solid bitumen (B). Reworked intertinite (I) maceral were also observed. Fluorescent and reflected white light.
		2.2	0.706	0.058	6	
		2.2	0.889	0.061	10	
		2.2	1.101	0.070	2	
8591	**75-08**	2	0.503	0.095	21	Similar to 8577/74-08 but with slightly higher reworked maceral (inertinite) content. Pyrite-rich shale with some lenses of fluoramorphinite-matrix (F) bituminite with yellow-fluorescing alginite inclusions (mainly Prasinophyte (P) and Leiosphaeridia), weakly fluorescing, low-reflecting, solid bitumen (B) and rare hydrocarbon fluid-inclusions (hcfi) were also observed.
		2.2	0.773	0.044	9	
		2.2	1.046	0.060	7	
8601	**76-08**	2	0.453	0.067	28	Pyrite-rich, black shale with some lenses of hebamorphinite and fluoramorphinite-matrix (F) bituminite with yellow-fluorescing alginite inclusions (mainly Prasinophyte (P) and Leiosphaeridia) and weakly fluorescing, low-reflecting, solid bitumen. Rare, yellow-fluorescing hcfi annealed in quartz matrix and chitinous fossils were also observed.
		2.2	0.729	0.096	7	
		2.2	1.042	0.030	3	
		2.2	1.320		1	
8609	**77-08**	2	0.646	0.062	15	Pyrite-rich, black shale with some amorphous kerogen (am), weakly fluorescing flluoramorphinite (F) with dull yellow-fluorescing alginite inclusions (mainly dull yellow-fluorescing Prasinophyte (P) and rare thick-walled Tasmanites like (T) alginite. Rare hydrocarbon fluid inclusions (hcfi) were also observed annealed in a quartz matrix. Fluorescent and reflected white light.
		2.2	0.888	0.034	6	
		2.2	1.270	0.092	4	
		4	0.456	0.028	2	
8619	**78-08**	2	0.904	0.108	14	Pyrite-rich, black mudstone. The organic matter content consists of amorphous kerogen (am) nonfluorescing amorphinite lenses, nonfluorescing hebamorphinite (H) with weakly, dull yellow to orange fluorescing alginite of unknown species (A?), reworked vitrinite and inertinite maceral. S = Siliceous microfossil. Fluorescent and reflected white light.
		2.2	1.226	0.064	9	
		2.2	1.530	0.059	4	
		2.2	1.7	0.066825842	6	
		4	0.660	0.035	2	
8620	**79-08**	2	0.581	0.082	25	Liptinite-rich, silty shale with some fluoramorphinite-matrix (F) bituminite lenses with yellow-fluorescing alginite inclusions (mainly Prasinophyte (P) and weakly fluorescing, nonfluorescing, low-reflecting granular bitumen (B) (=0.300 %Ro). Leiosphaeridia alginite (L). Fluorescent and reflected white light.
		4	0.300	0.045	4	
		2.2	0.805	0.055	8	

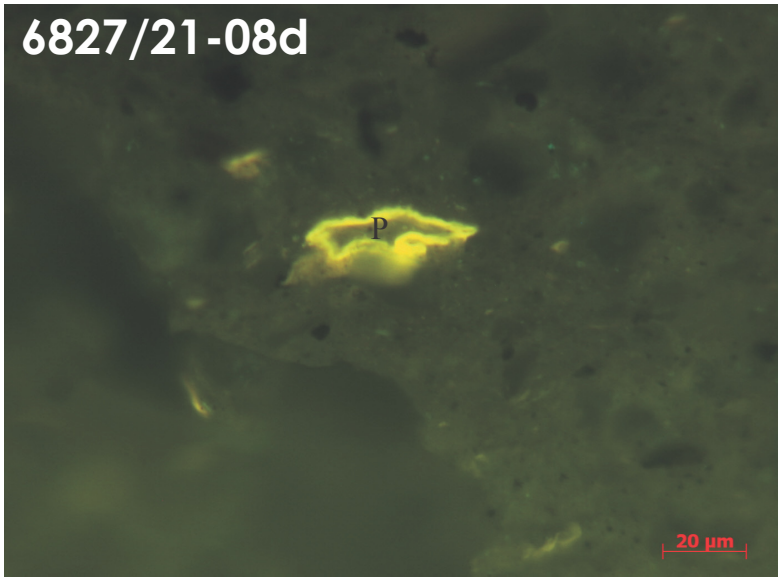
Sample No.	Photo No.	Organic Type	Vitrinite Reflectance ($\%_R$)	Standard Deviation	n	Comments
8638	**80-08**	2	0.811	0.115	17	Pyrite-rich, black mudstone with high content of reworked inertinite maceral. The indigenous population of organic matter are mainly amorphous kerogen (am)/non fluorescing hebamorphinite, small lenses of non fluorescing amorphinite and rare non-fluorescing solid bitumen (B). Dull yellow to orange fluorescing Prasinophyte (P) alginite are the main liptinite population. Fluorescent and reflected white light.
		4 (2?)	0.563	0.026	4	maybe suppressed
		2.2	1.171	0.076	6	
8659	**81-08**	2	0.901	0.090	22	Pyrite-rich shale with continuous network of spent amorphous kerogen (am) and phosphatic, granular grey matter (hebamorphinite (H?)) from bacterial remains, some with solid and granular bitumen (B). Dull yellow to orange-fluorescing alginite (A?) and rare, yellow-fluorescing hydrocarbon fluid inclusions (hcfi) were also observed. Fluorescent and reflected white light.
		2.2	1.152	0.051	8	
		2.2	1.471	0.086	5	
8671	**82-08**	4	1.170	0.076	34	Bitumen-rich carbonates. Isotropic, nonfluorescing bitumen (B) have migrated into carbonate fractures and pores. Rare, yellow- fluorescing hydrocarbon fluid inclusions (hcfi) annealed into quartz mineral. Fluorescent and reflected white light.
8672	**83-08**	2	0.508	0.042	7	Alginite and pyrite-rich shale with high concentrations of hebamorphinite and fluoramorphinite with bright, yellow-fluorescing alginite (predominantly Prasinophyte and Leiosphaeridiaor possibly other filamentous algae) and bitumen inclusions, rare acanthomorphic acritarch. Yellow-fluorescing liquid oil is released when bitumen is viewed under UV fluorescence. Fluorescent and reflected white light.
		2.2	0.709	0.064	19	
		2.2	0.927	0.065	11	

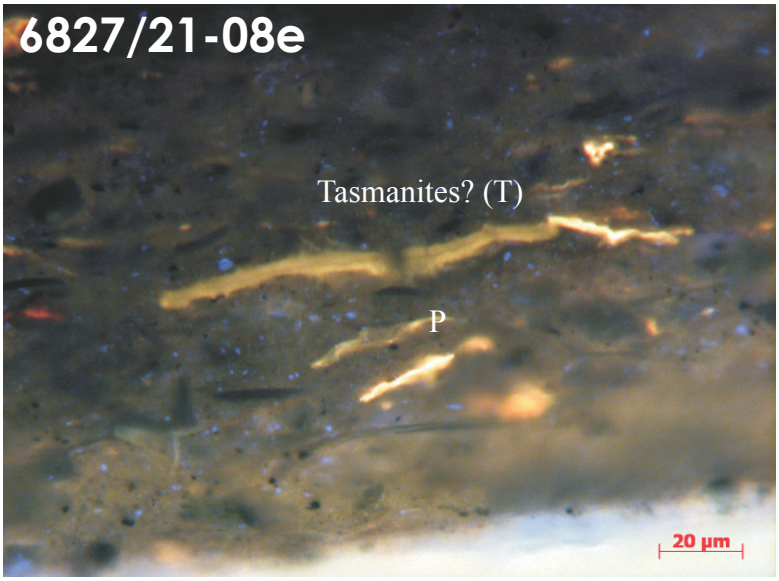
Appendix 8 – Colorado Group Organic Petrography Photographs



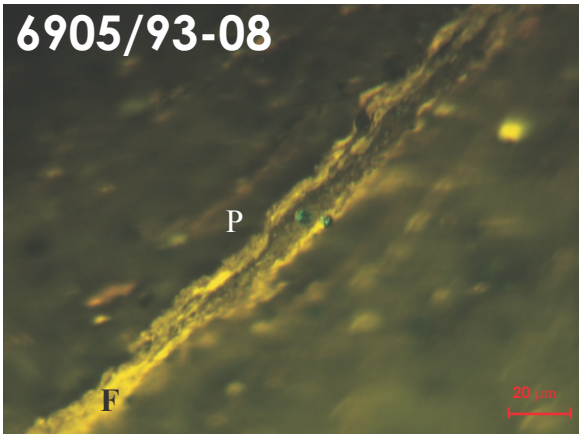


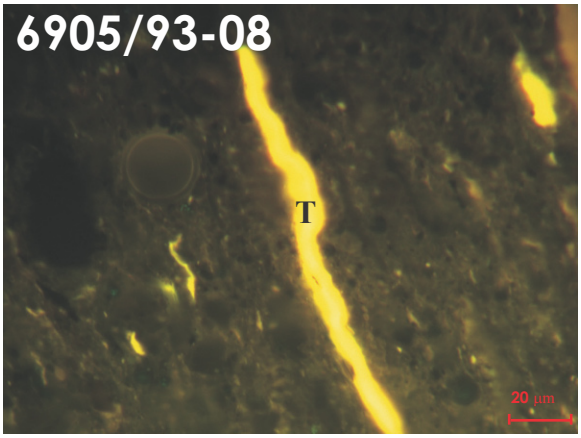


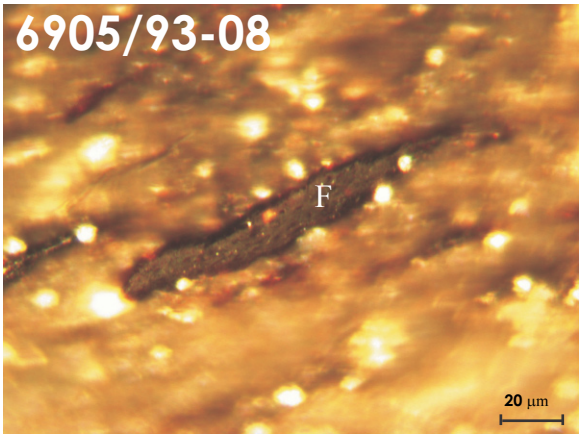


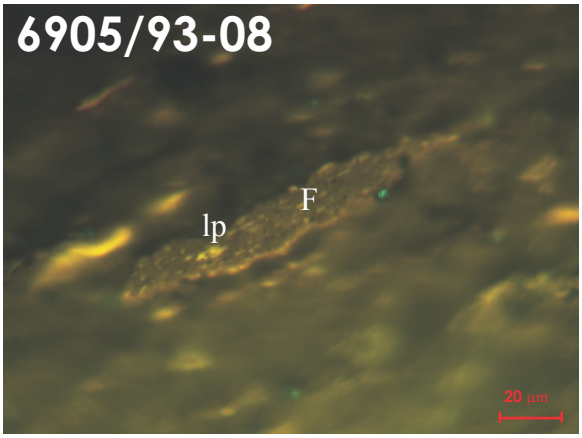


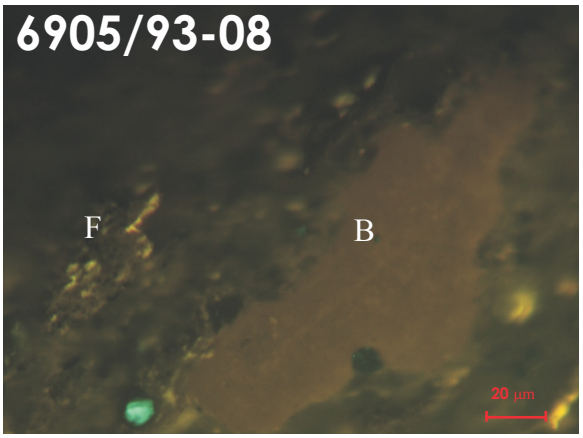
6827/21-08. Organically rich shale with mostly yellow-fluorescing Prasinophyte (P) alginite. Rare, yellow-fluorescing canthomorphic acritarchs (ac) and like alginite were also observed. Fluorescent and white light. T = *Tasmanites*; High amount of reworked coaly fragment with high %Ro (vitrinite reflection).

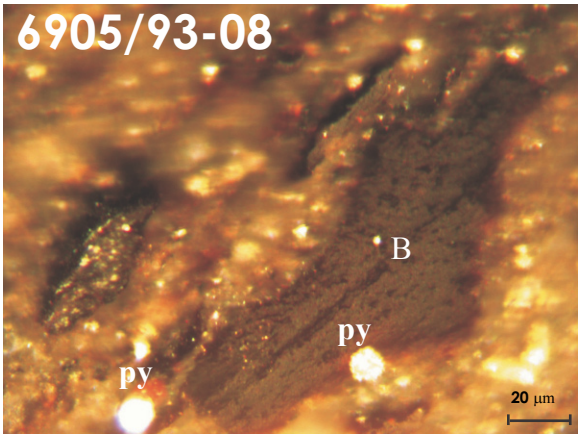


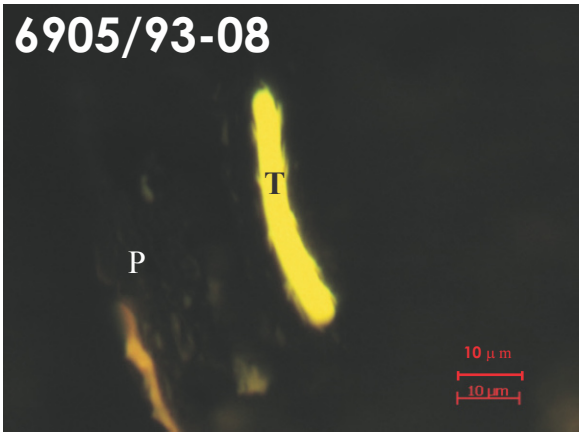




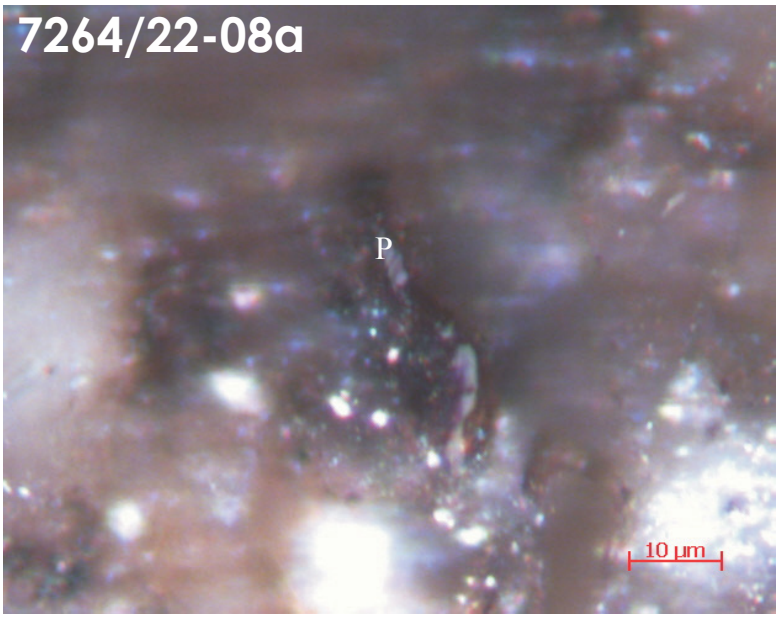


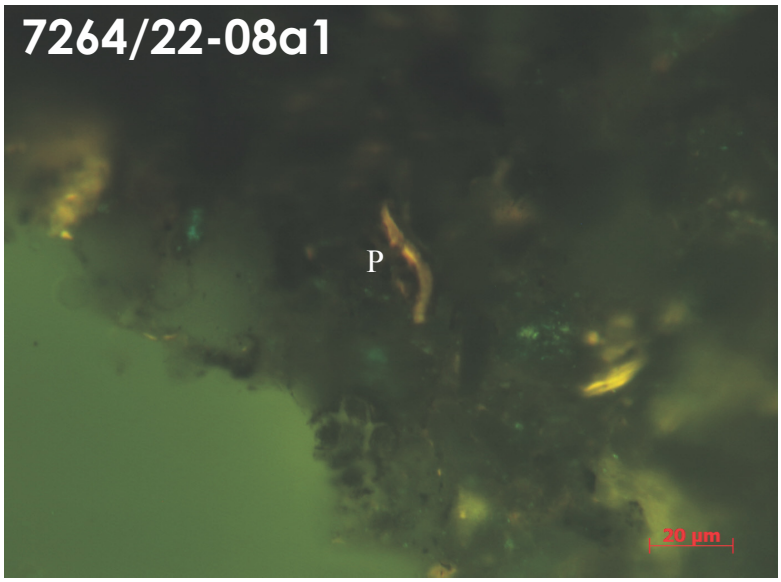


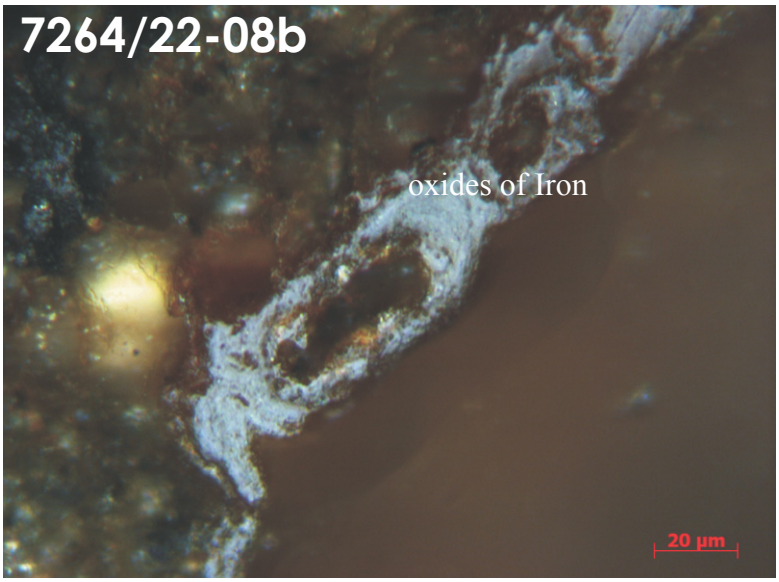


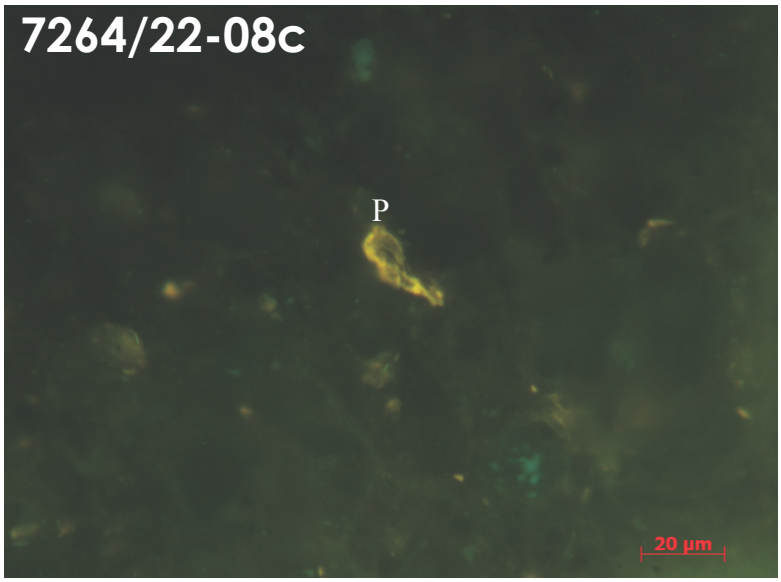


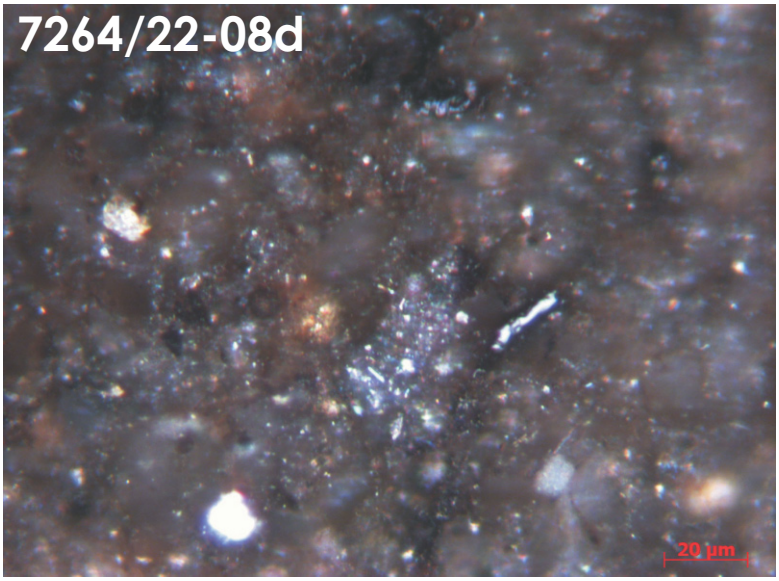
6905/93-08. Liptinite and pyrite (py)-rich shale, consisting mostly of yellow to brown-fluorescing fluoramorphinite-matrix bituminite (F) lenses with yellow to dull yellow-fluorescing alginite and liptodetrinite (lp) inclusion, yellow-fluorescing Prasinophyte (P) and thick-walled Tasmanites-like (T) alginite, and orange-fluorescing, solid bitumen (B). Rare reworked organic matter. Fluorescent and reflected white light.

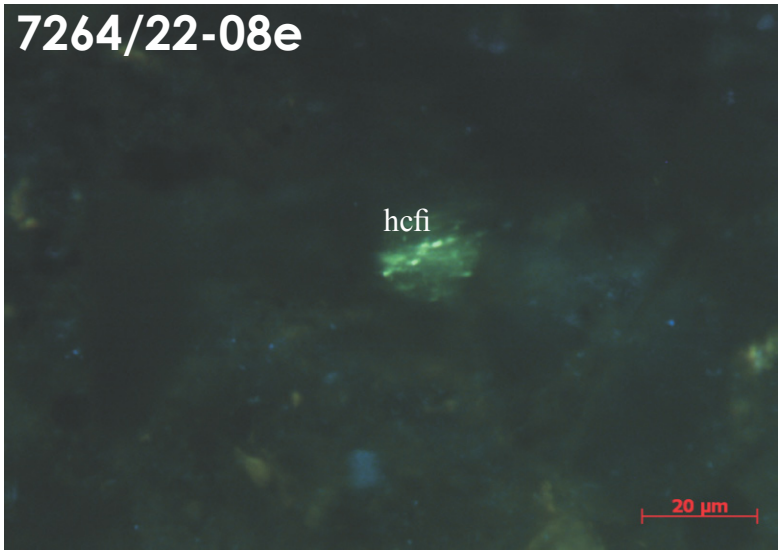

7264/22-08a
P
10 µm

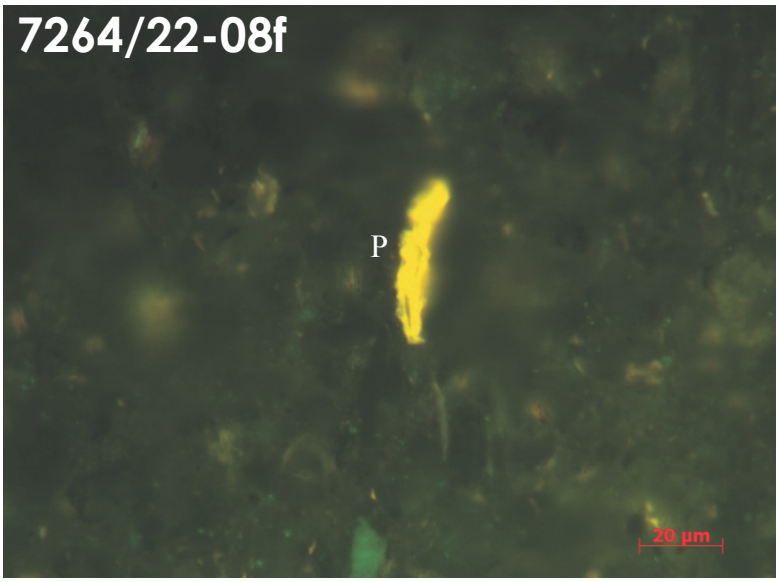

7264/22-08a1
P
20 µm

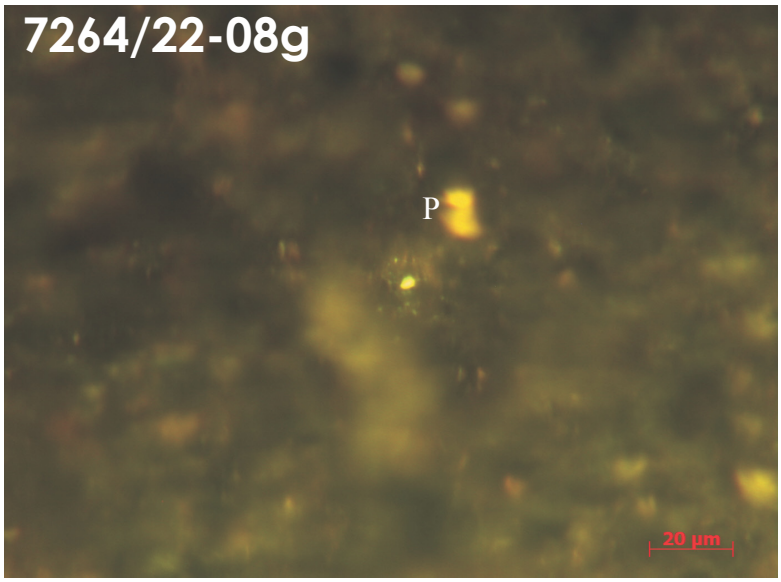

7264/22-08b
oxides of Iron
20 µm


7264/22-08c
P
20 µm

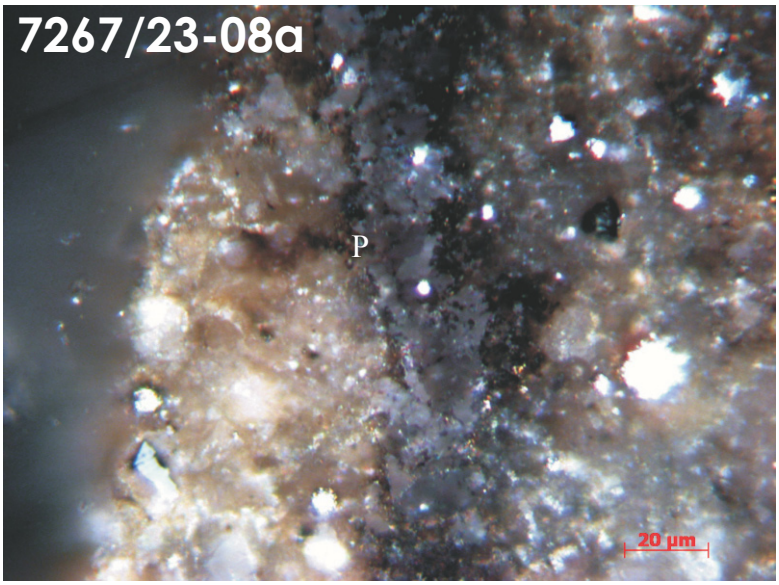

7264/22-08d
20 µm

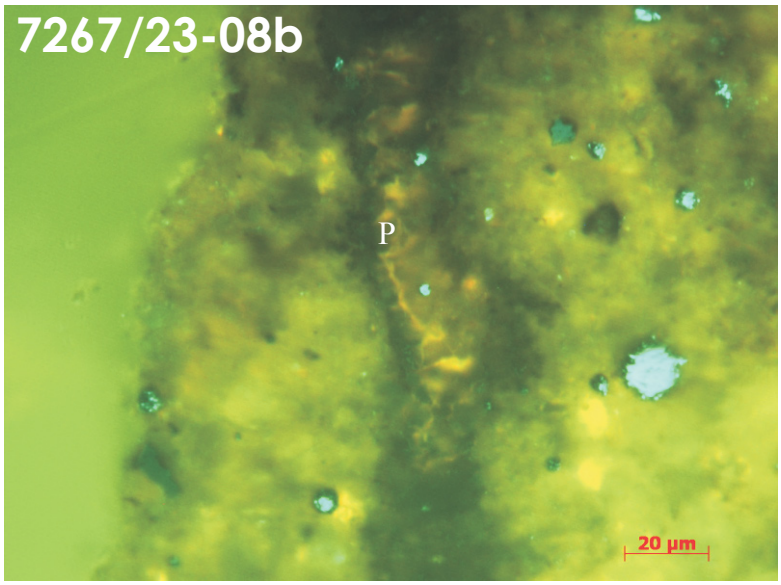

7264/22-08e
hcfi
20 µm

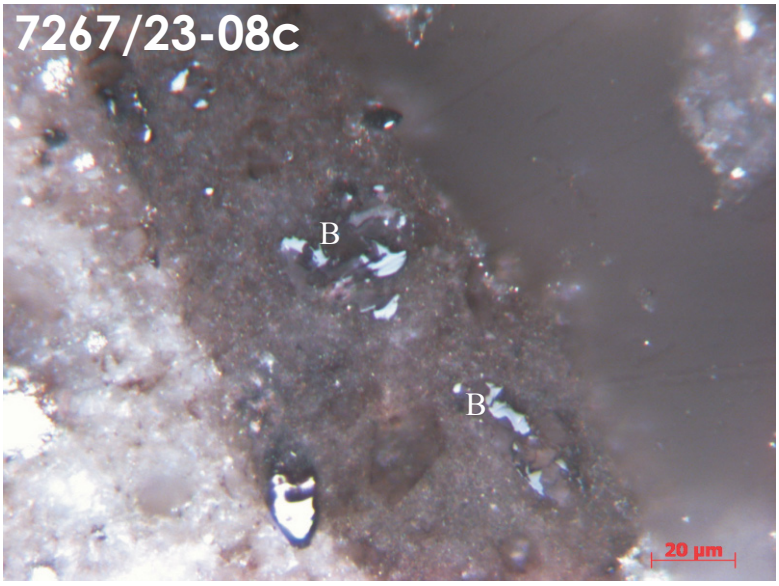


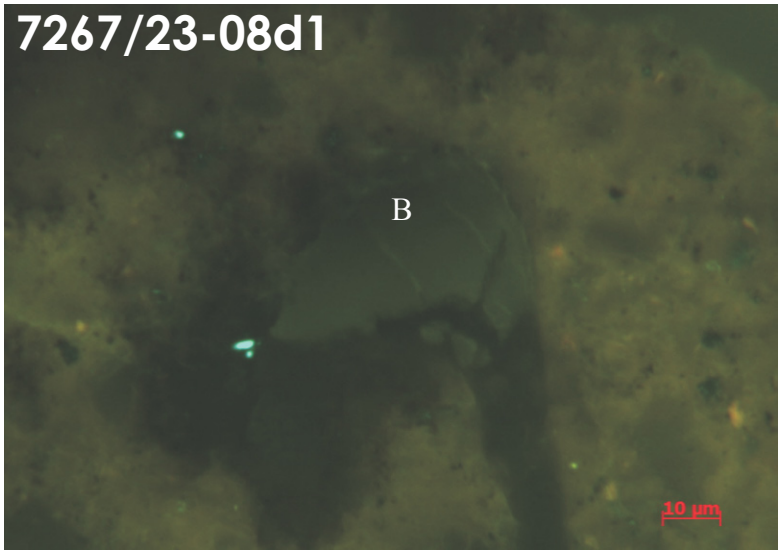


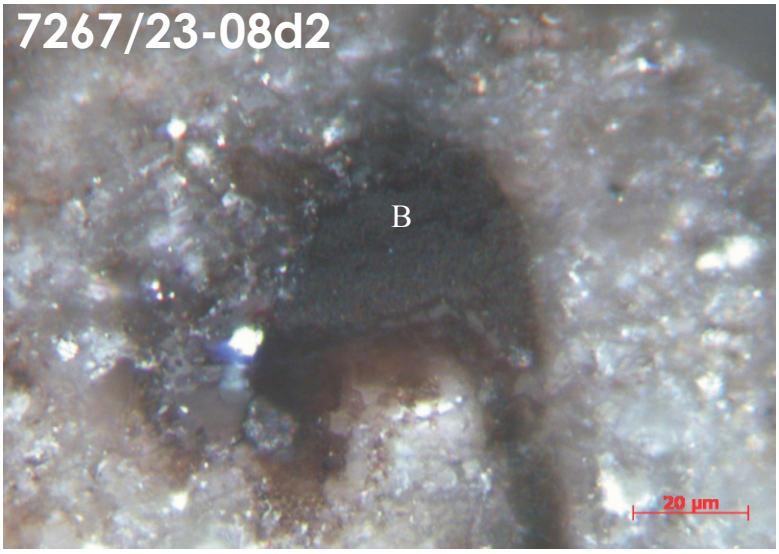
7264/22-08. Organically lean shale with mostly reworked organic matter. Some yellow-fluorescing Prasinophyte (P) alginite and rare *Leiosphaeridia*-like alginite. The sample is also partially oxidized. Some quartz particles contain hydrocarbon fluid-inclusions (hcfi). Fluorescence and white light.



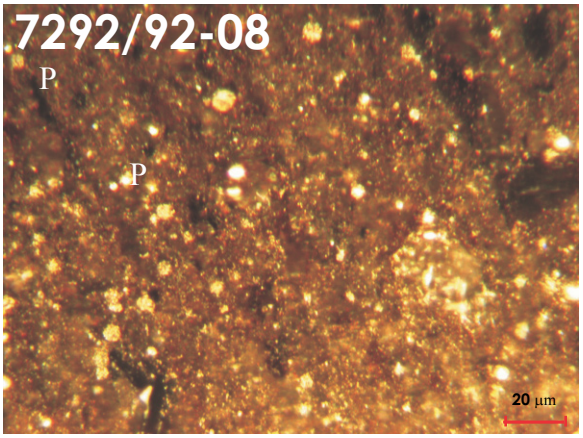


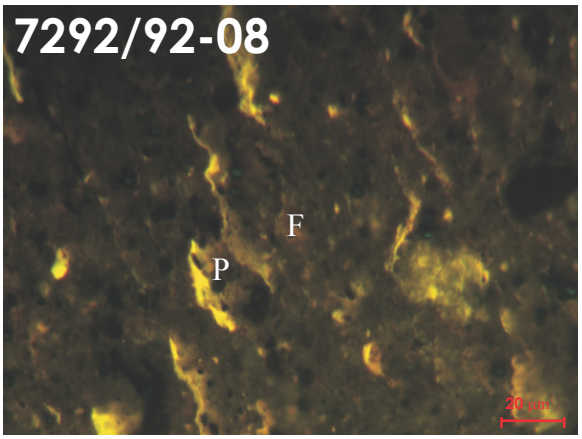


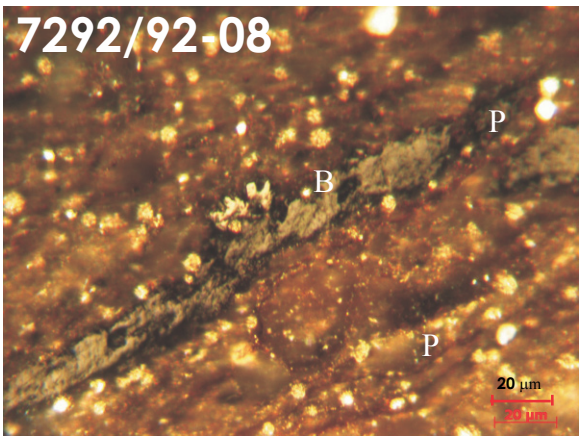


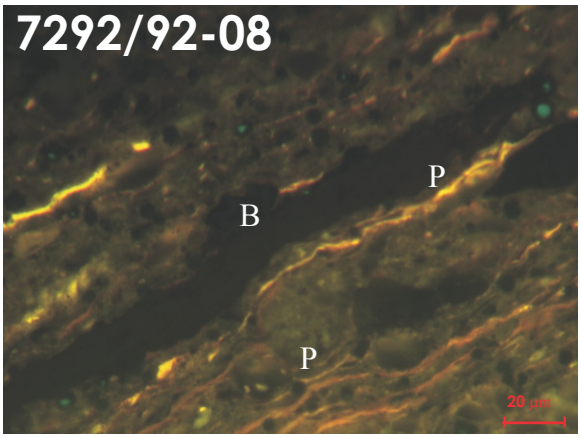


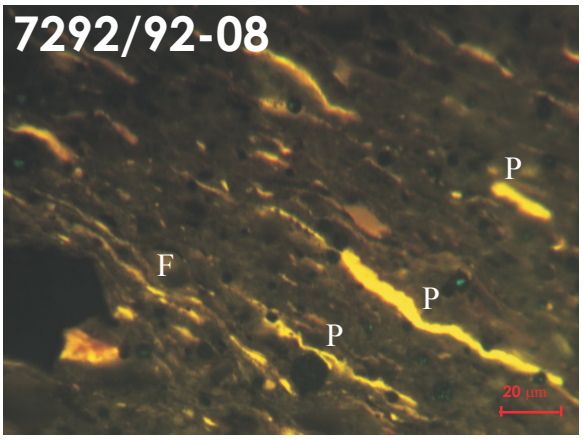
7267/23-08. Shale/carbonate with some weakly fluorescing, solid primary bitumen (B) brecciated within shale and carbonate matrices. Some high-reflecting, solid migrabitumen (B) in pores and fractures were also observed. P = Prasinophyte alginite. Fluorescent and white light.

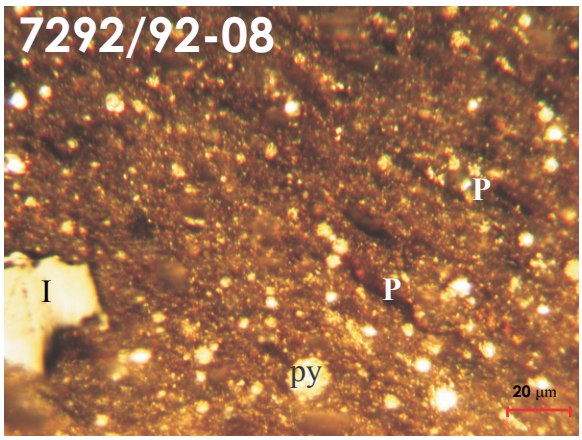

7292/92-08
P
P
20 µm

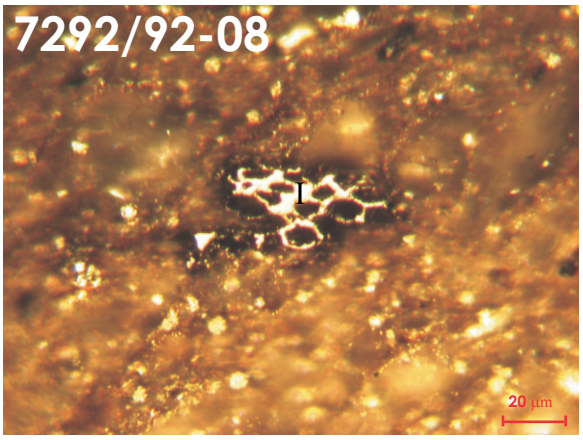

7292/92-08
F
P

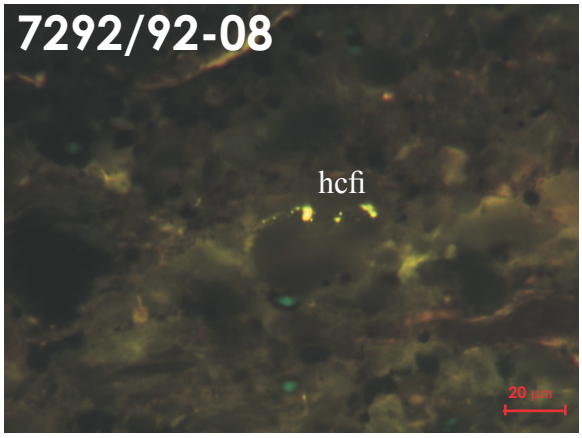

7292/92-08
P
B
P
20 µm

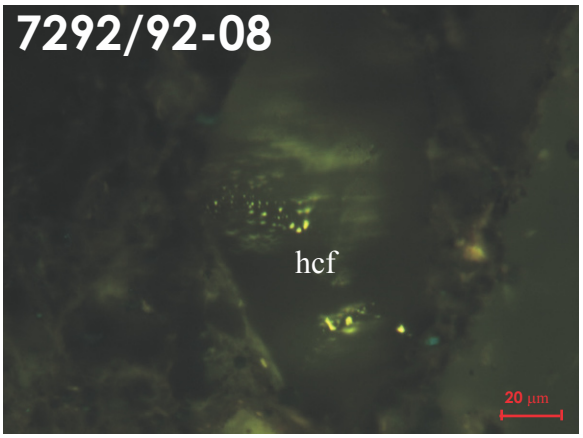

7292/92-08
P
B
P

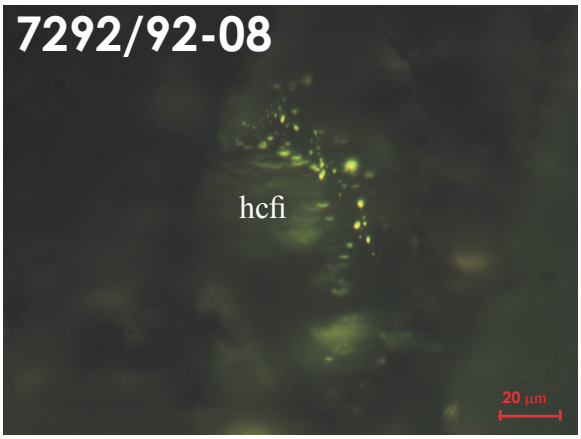

7292/92-08
P
F
P
P
20 µm

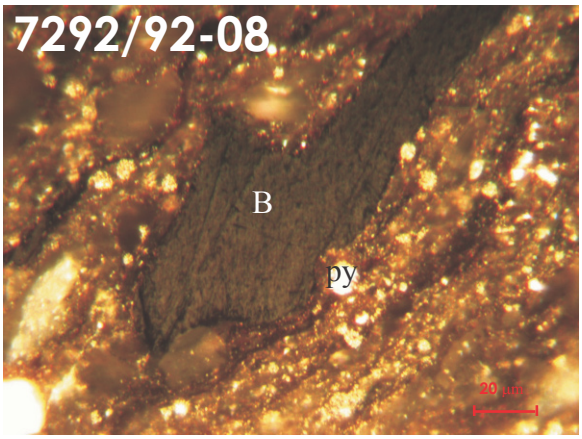

7292/92-08
P
I
P
py
20 µm


7292/92-08
I
20 µm

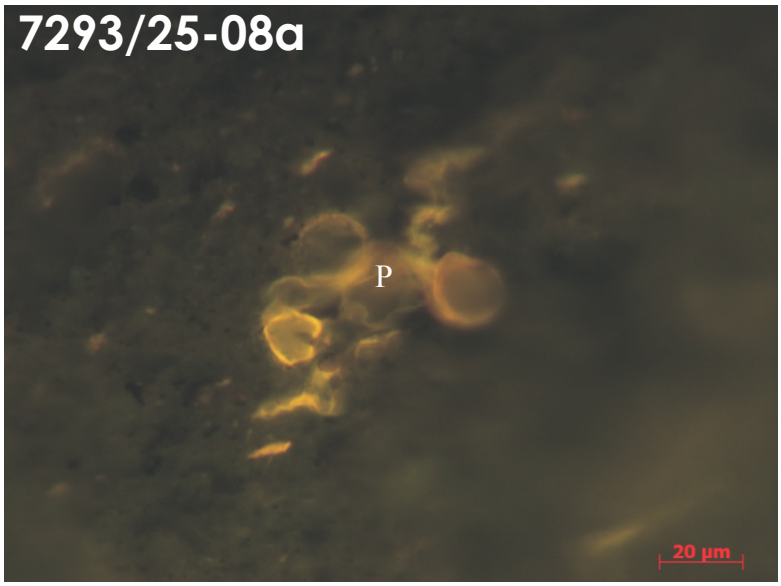

7292/92-08
hcfi
20 µm

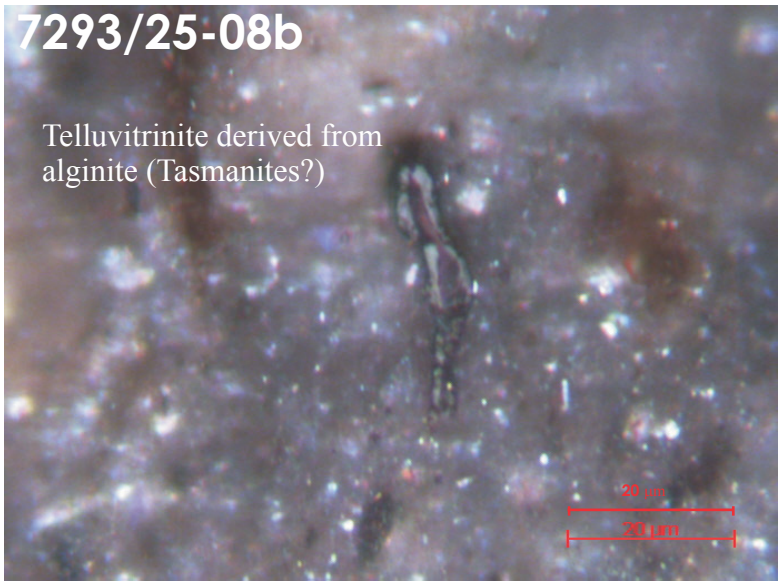


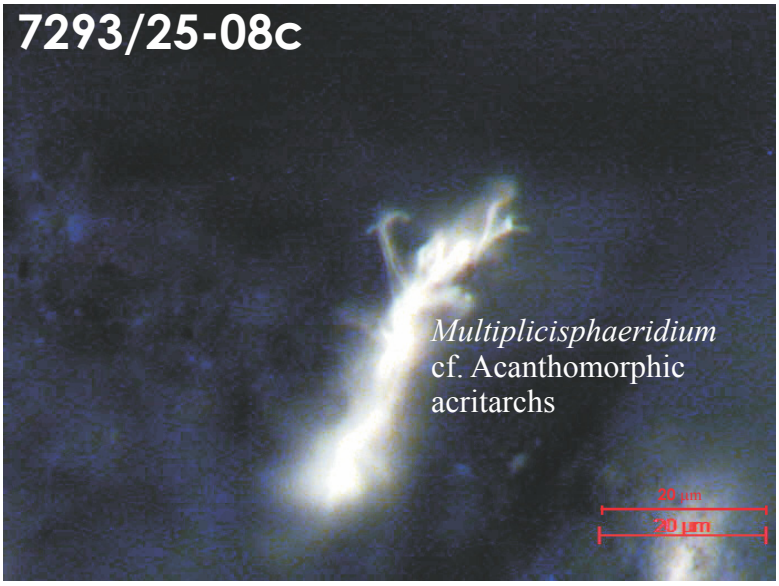


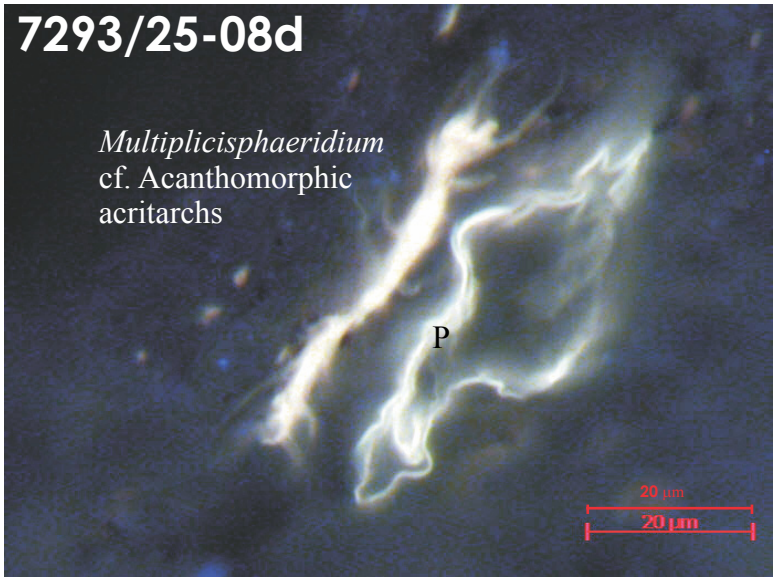


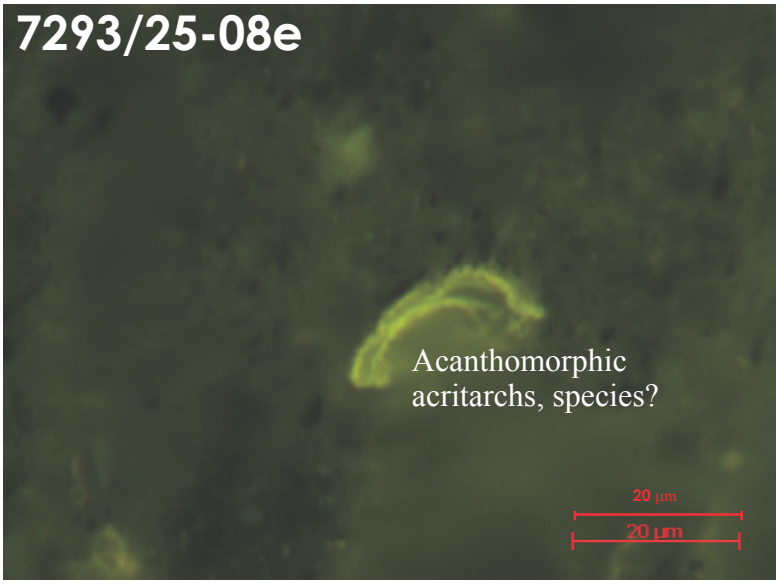
7292/92-08. Liptinite and pyrite (py)-rich shale, consisting mostly of yellow-fluorescing Prasinophyte alginite (P). Also noted are weakly fluorescing fluoramorphinite (F), orange-fluorescing, solid bitumen (B), rare, yellow-fluorescing sporinite, yellow-fluorescing hydrocarbon fluid-inclusion (hcfi) annealed to and within quartz microfractures, and reworked inertinite maceral. Fluorescence and reflected white light.

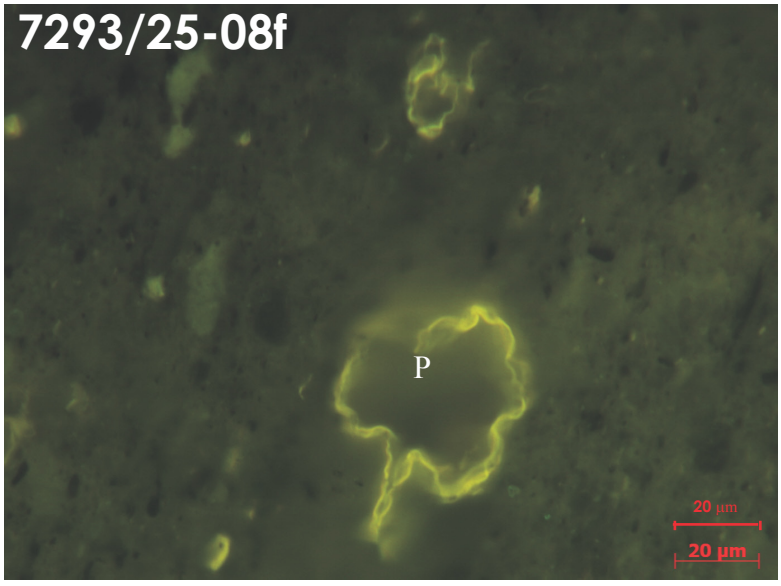

7293/25-08a
P
20 µm

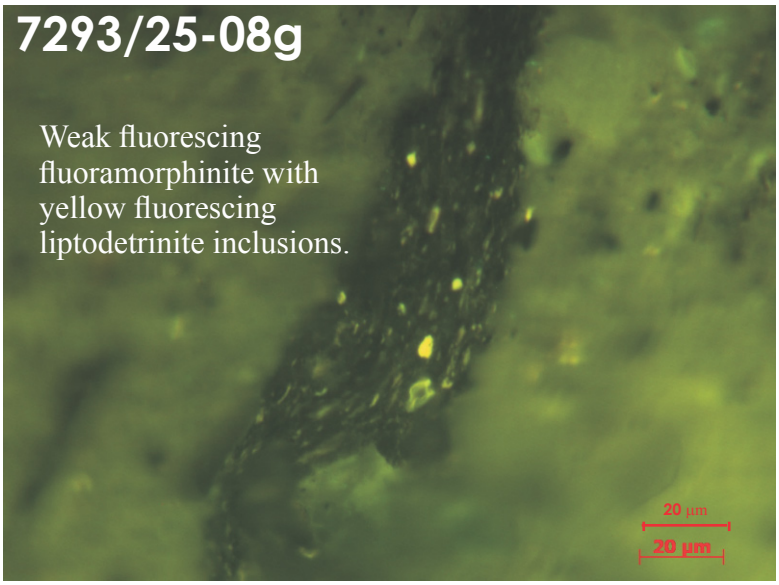

7293/25-08b
Telluvitrinite derived from
alginite (Tasmanites?)
20 µm
20 µm

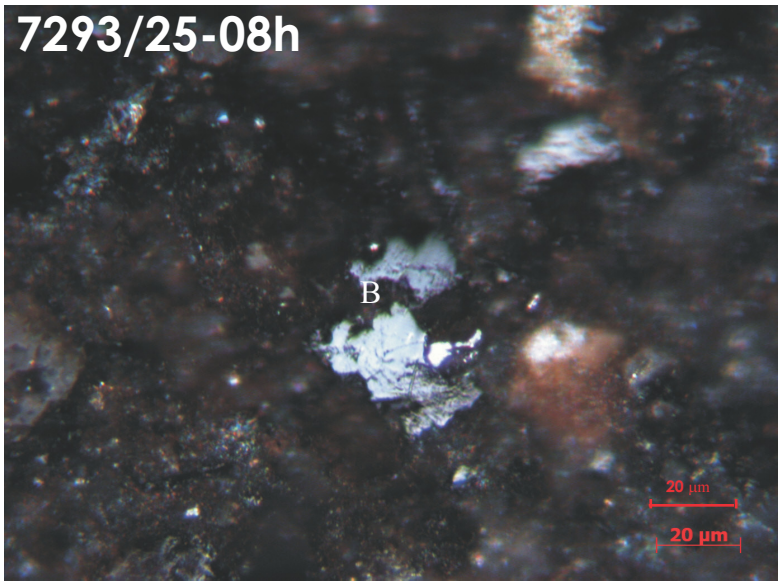

7293/25-08c
Multiplicisphaeridium
cf. Acanthomorphic
acritarchs
20 µm
20 µm


7293/25-08d
Multiplicisphaeridium
cf. Acanthomorphic
acritarchs
P
20 µm
20 µm

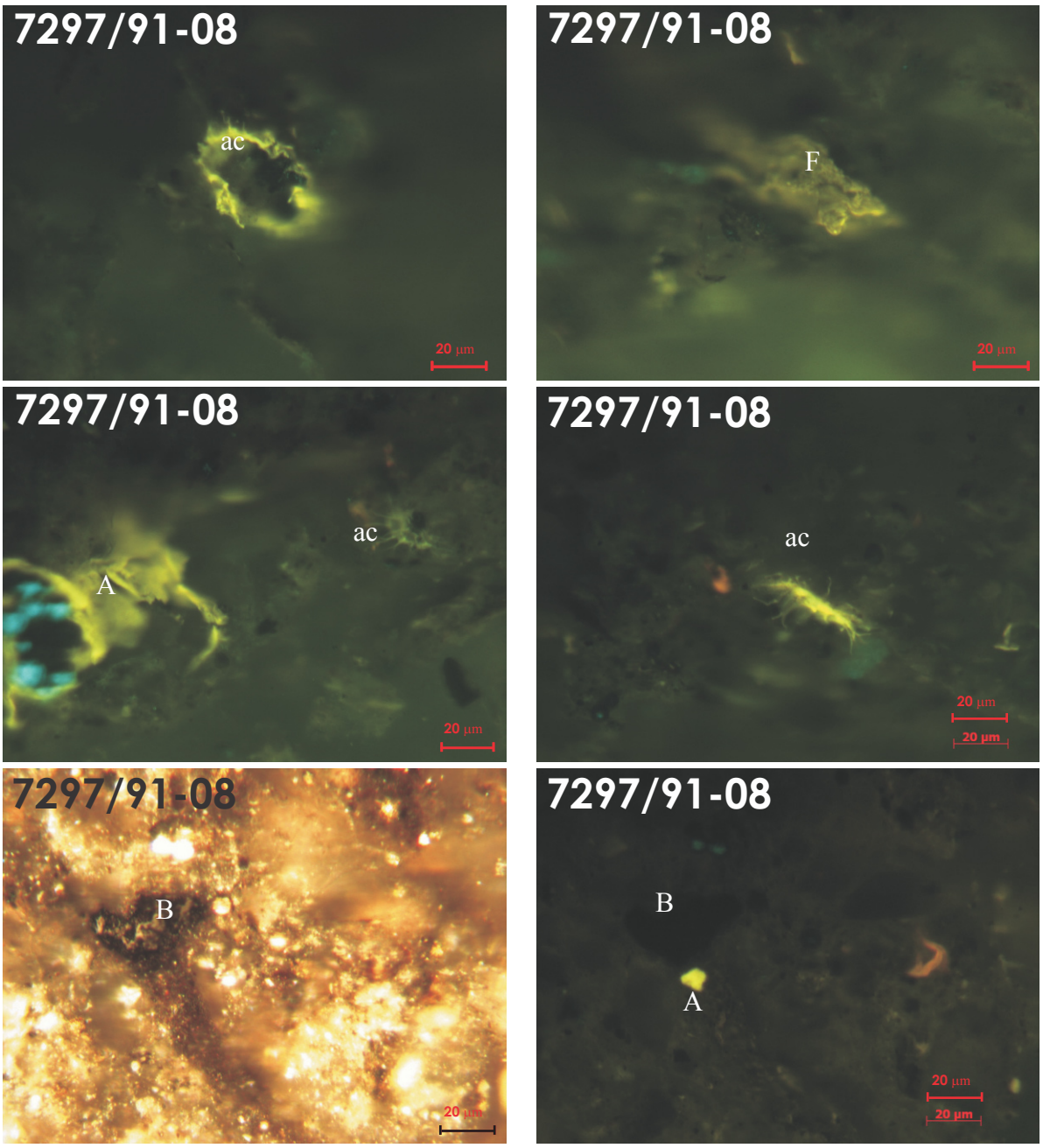

7293/25-08e
Acanthomorphic
acritarchs, species?
20 µm
20 µm


7293/25-08f
P
20 µm
20 µm

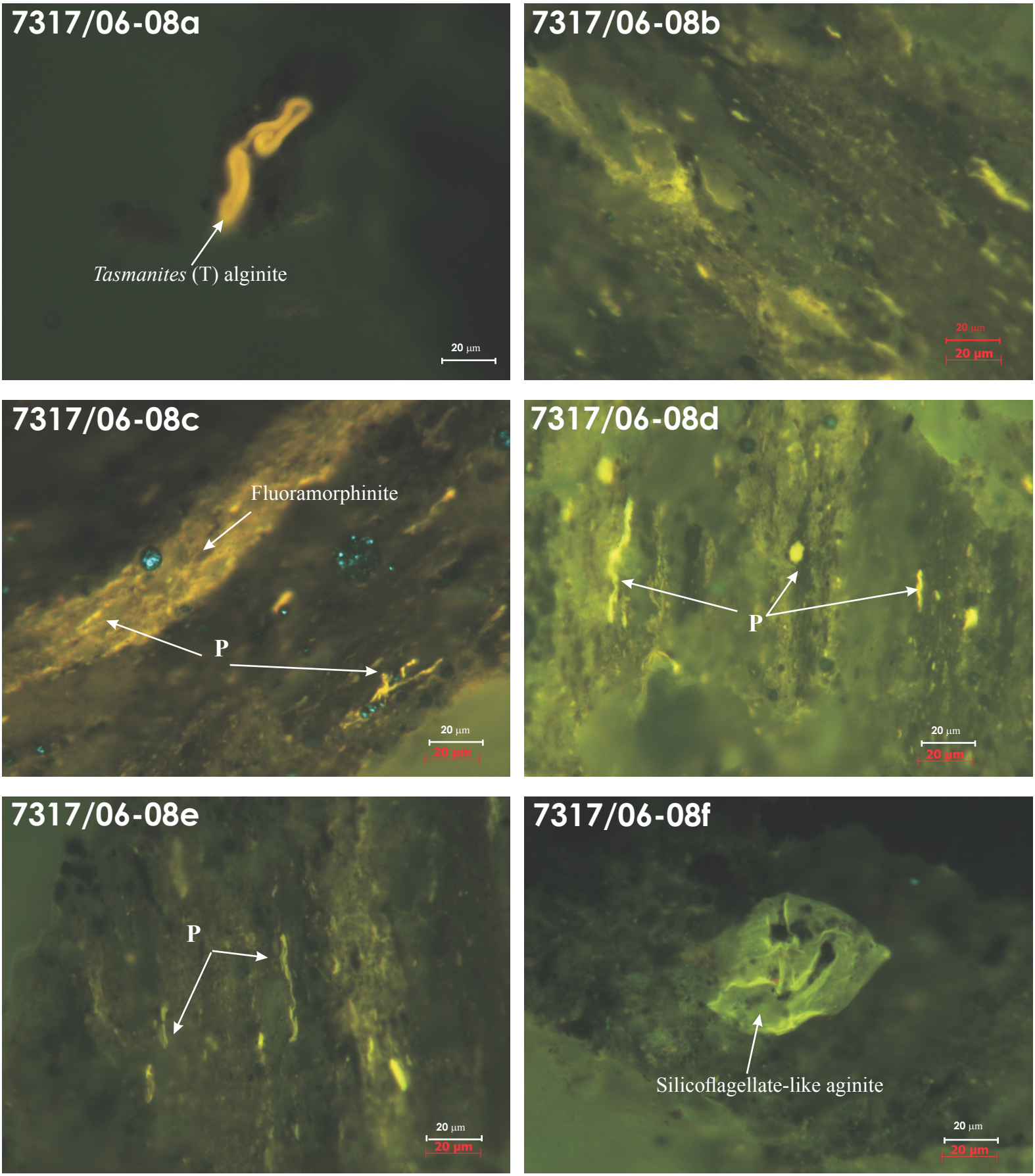




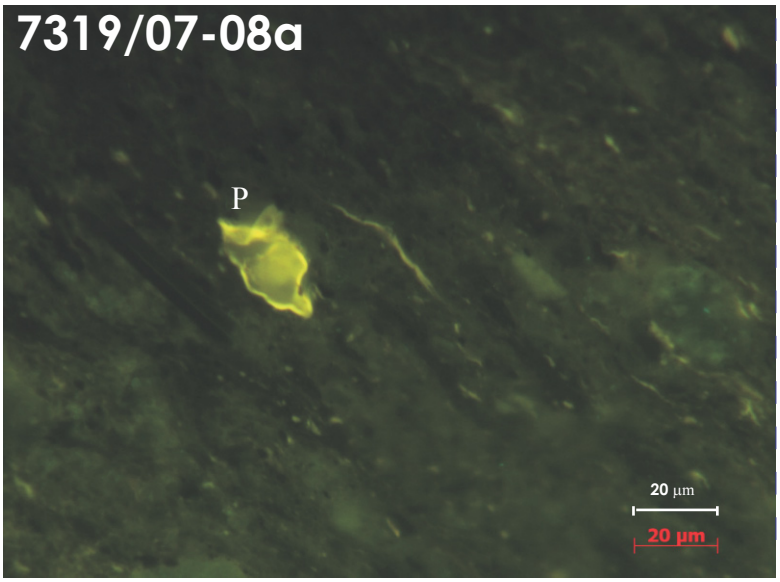
7293/25-08. Liptinite-rich shale with mostly thin-walled, yellow-fluorescing Prasinophyte alginite (P), including rare, vitrinitized, thick-walled *Tasmanites* alginite. Also observed are yellow-fluorescing Hystricosphaeridium cf. or Multiplicisphaeridium cf. acanthomorphic acritarchs and thick lenses of fluoramorphinite matrix with yellow-fluorescing liptodetrinite inclusions. Fluorescent and white light.

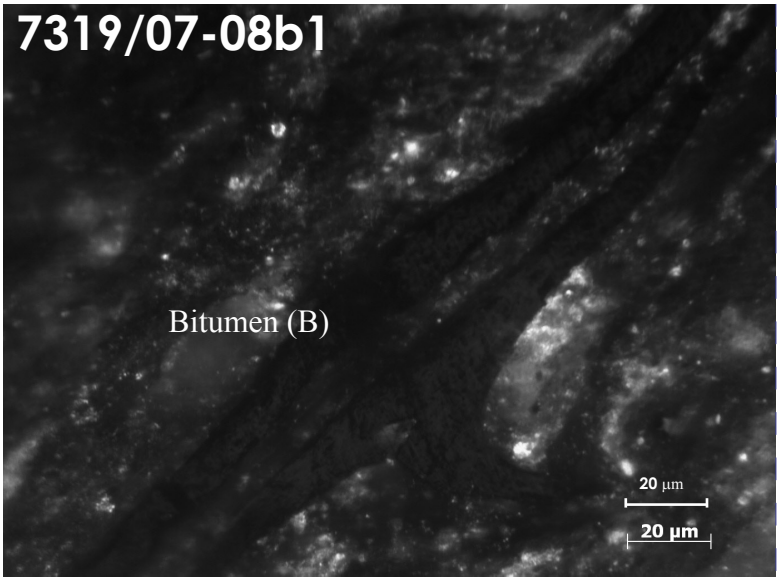


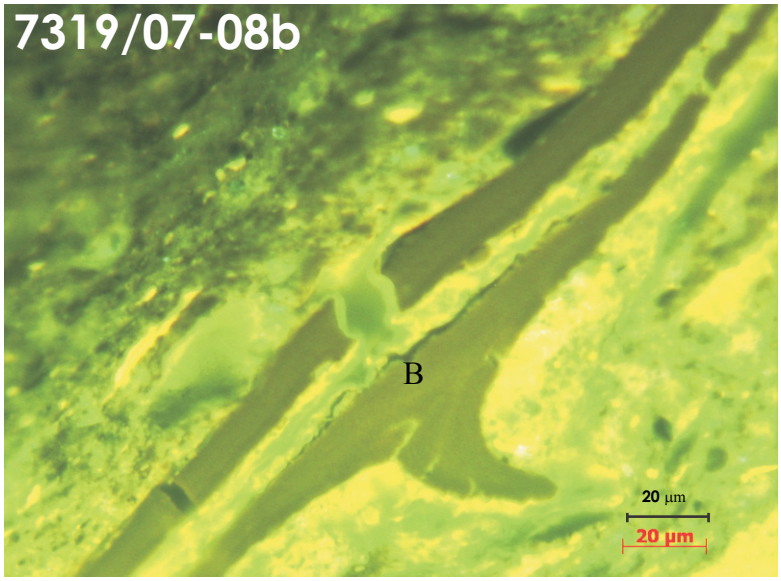
7297/91-08. Contains yellow to dull yellow-fluorescing alginite (A), possibly thin-walled *(Leiosphaeridia*) and yellow-fluorescing acanthomorphic arcitarch (ac), possibly Multiplicisphaeridium cf.). High concentration of reworked organic matter (coaly fragment, vitrinite and inertinite). Similar to 7296/90-08. Fluorescent and reflected white light.

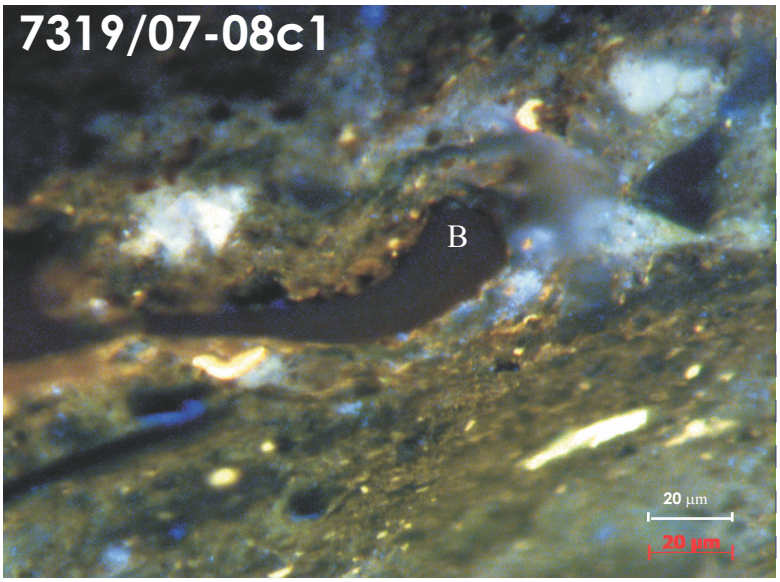


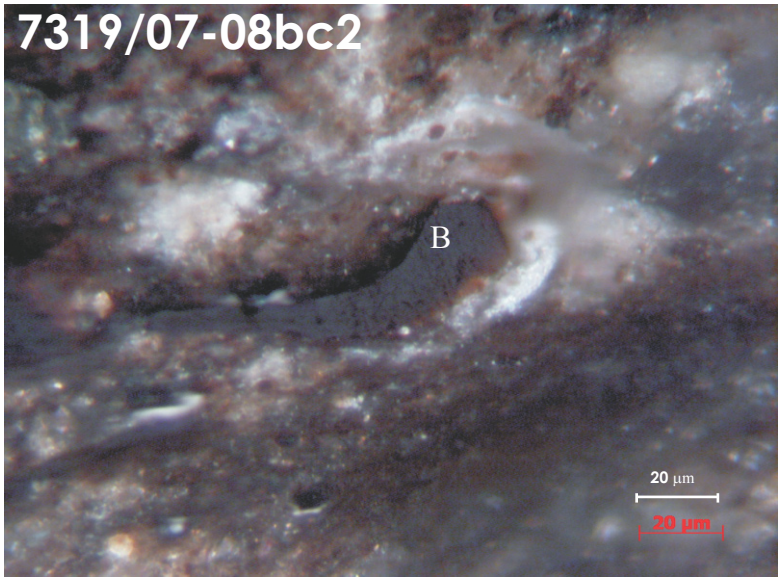
7317/06-08. Liptinite and pyrite (framboidal)-rich lime-shale, with mostly yellow-fluorescing alginite (thick-walled Tasmanites (T), Prasinophytes (P) and cocoidal alginite) and yellow-orange-fluorescing solid bitumen. Concentration of fluoroamorphinite with inclusions of yellow-fluorescing alginite. Yellow-fluorescing silicoflagellate were also observed. Fluorescent and white light.



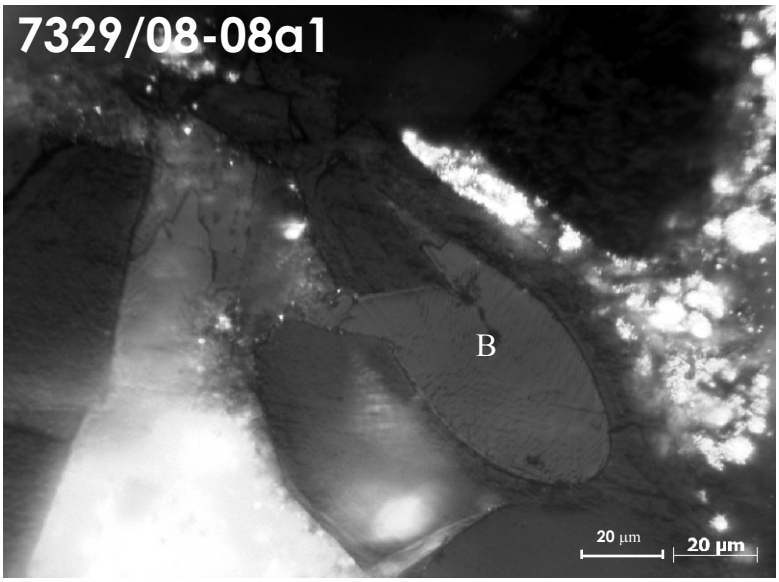


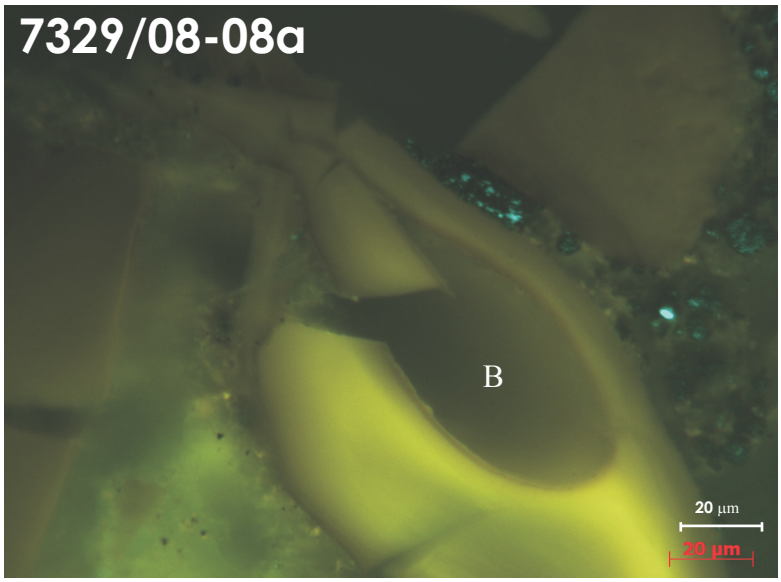


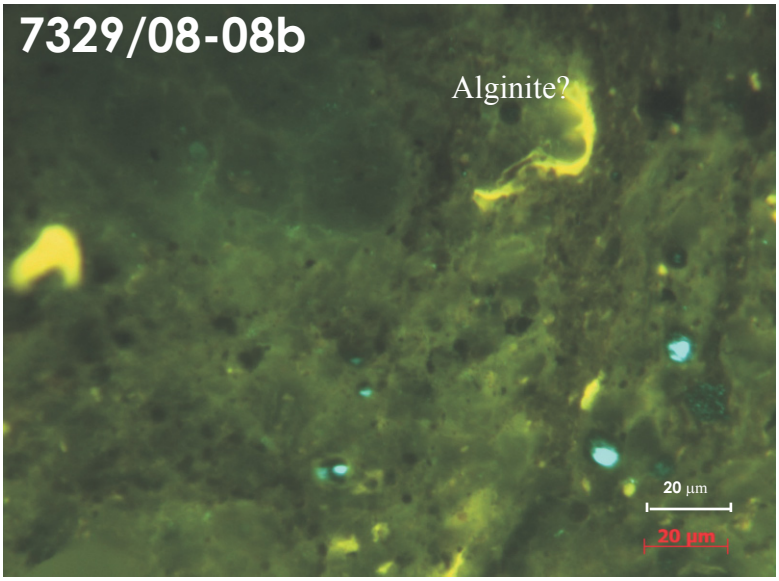


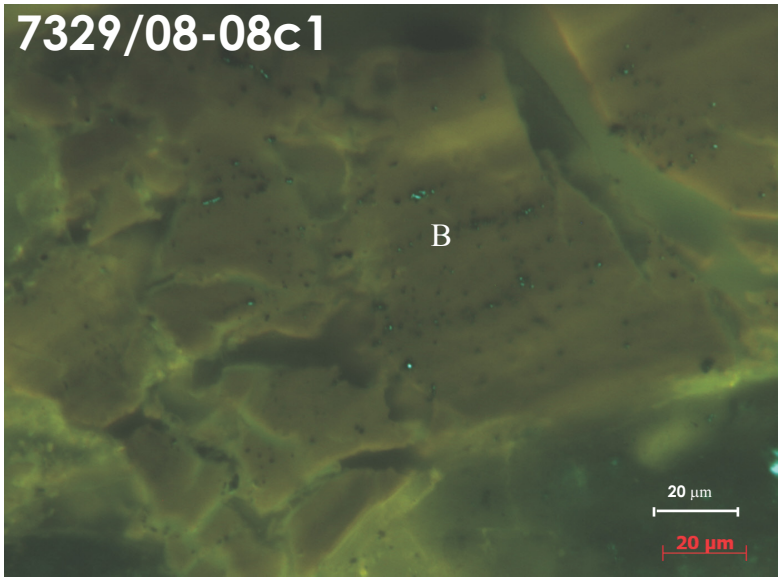


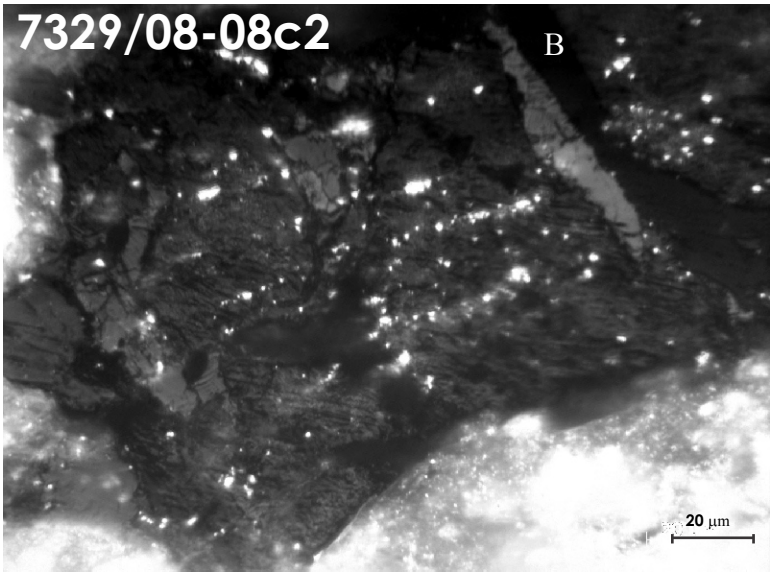
7319/07-08. Liptinite and pyrite (framboidal)-rich lime-shale, with mostly yellow-fluorescing Prasinophytes (P) and some coccoidal alginite. High percentage of orange-fluorescing solid bitumen (B). Fluoramorphinite matrix with yellow-fluorescing alginite inclusions was also observed. Fluorescent and white light.



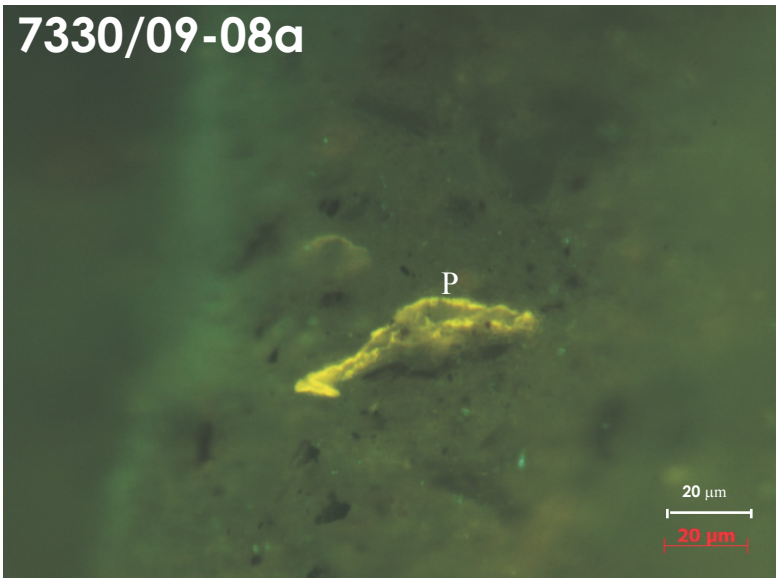


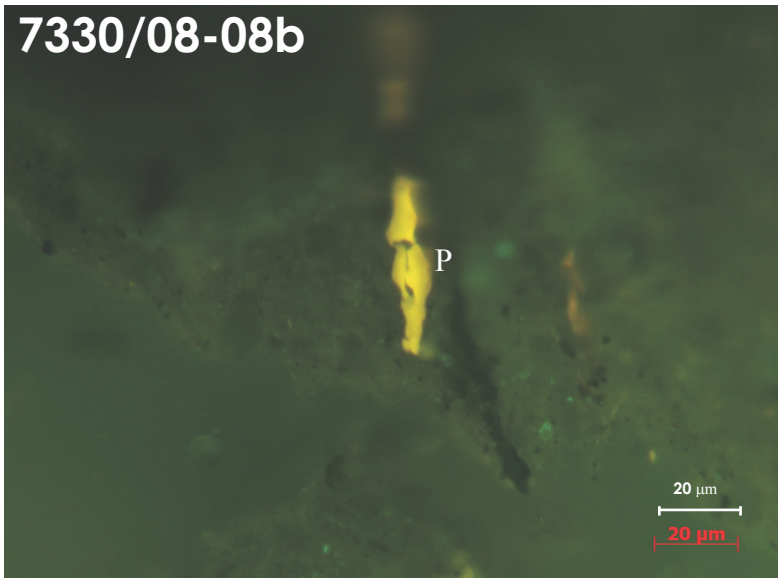




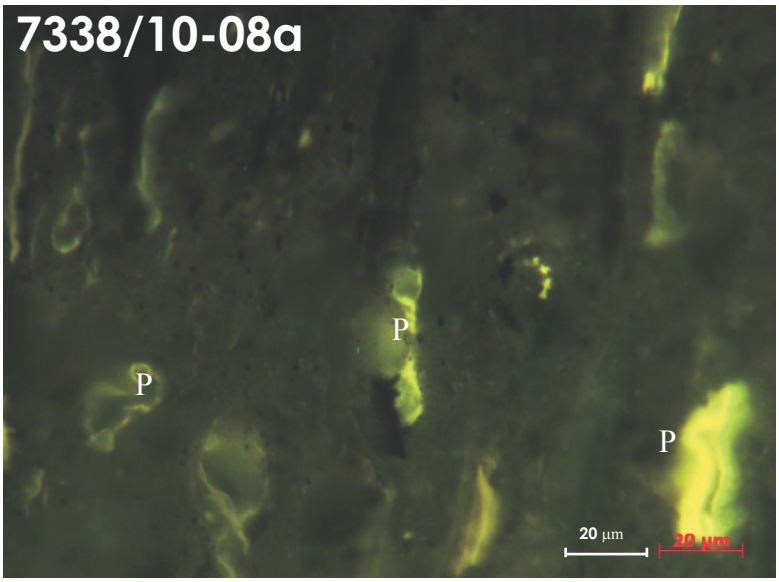


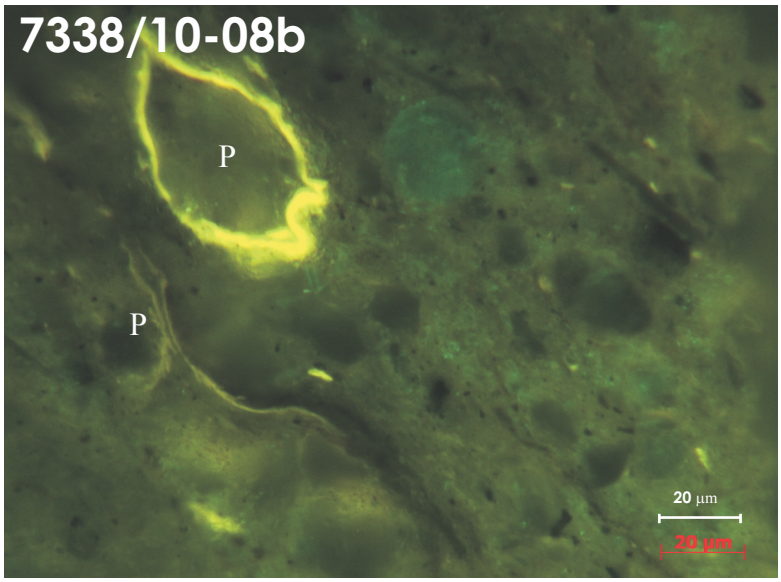
7329/08-08. Bitumen-rich (B), bone-bed shale, yellow to orange-fluorescing bitumen, some contain high pyrite inclusions. Yellow-fluorescing alginite found in silty shale brecciated between a carbonate matrix. Fluorescent and white light.

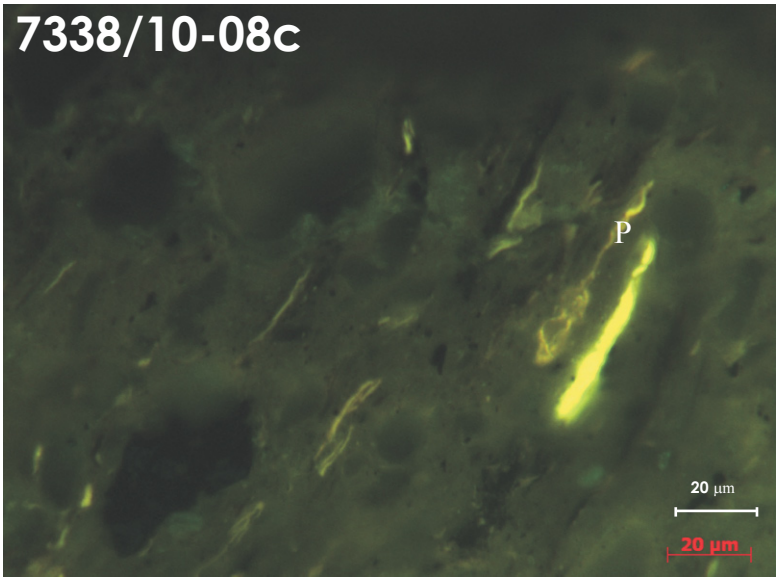


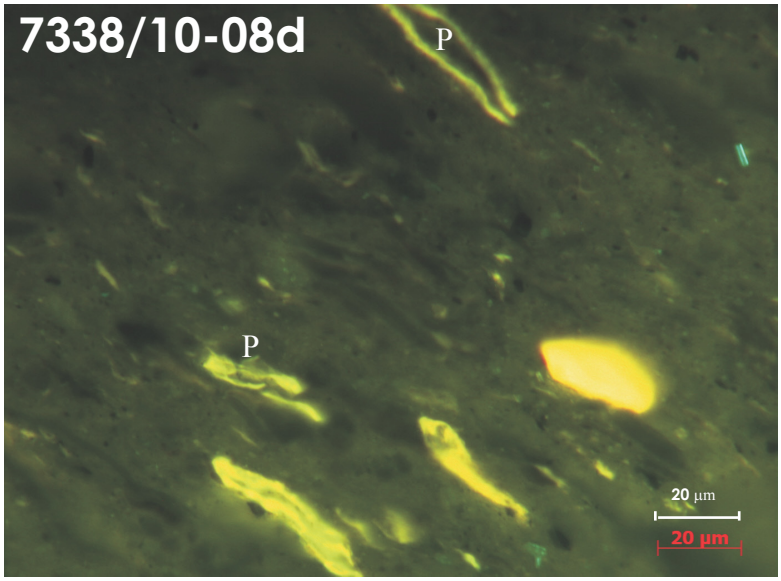


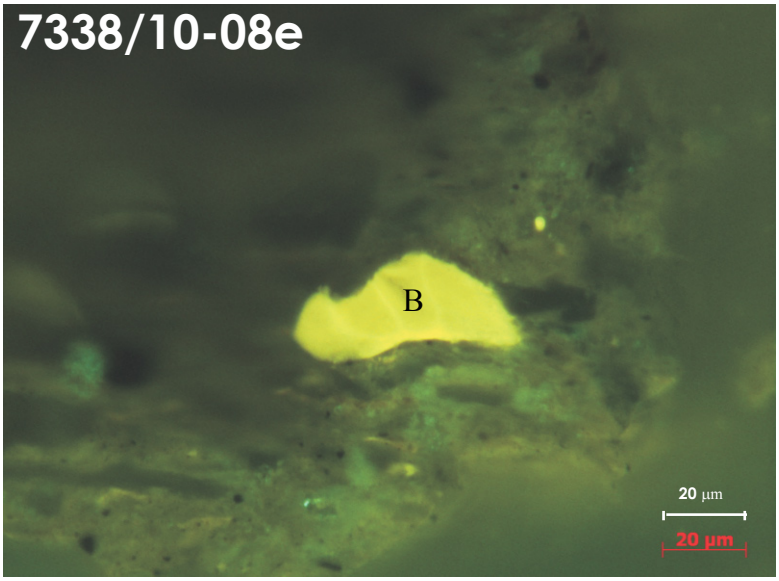
7330/09-08. Organically lean, silty shale with very small amounts of liptinite, Prasinophytes (P) and rare coccoidal alginite. Fluorescent light.

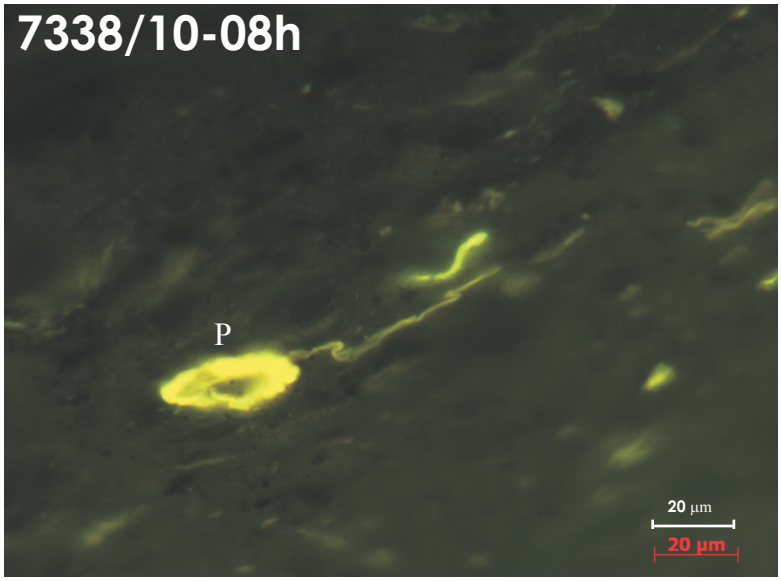




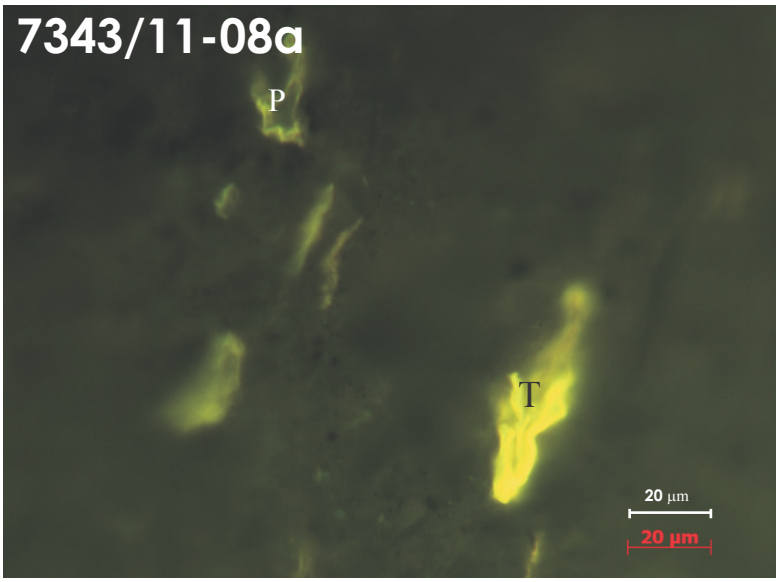


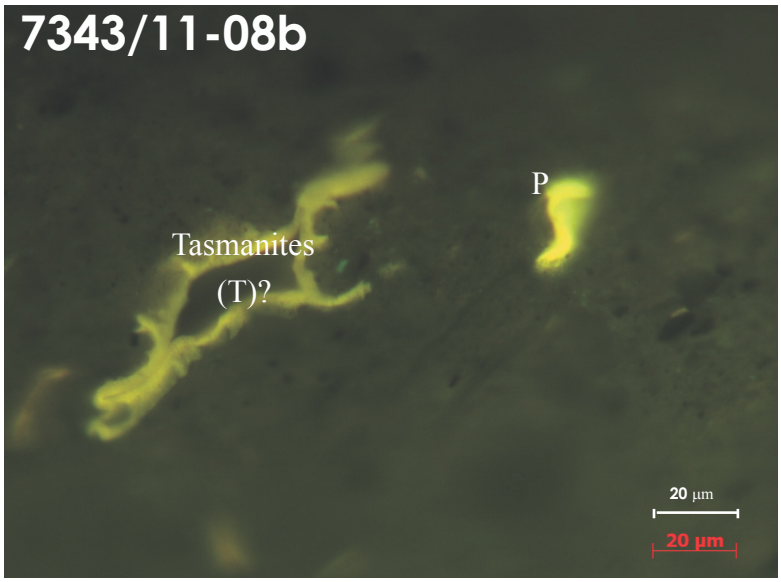


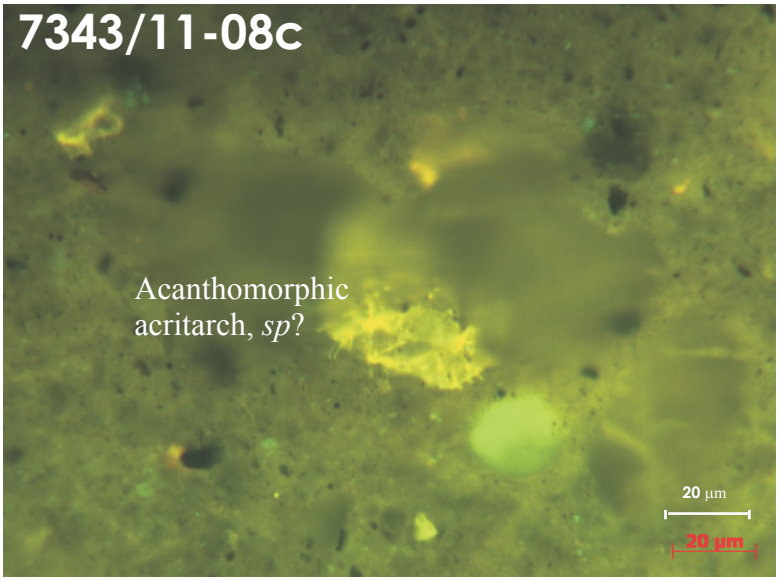


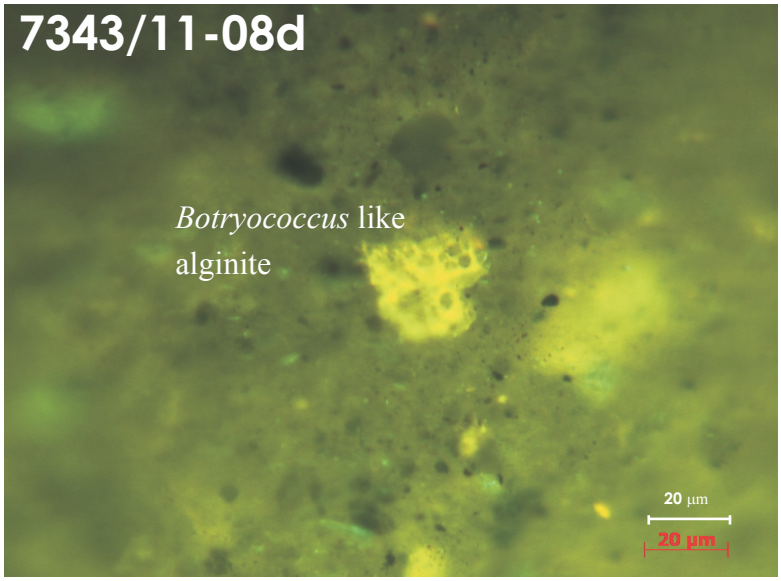


7338/10-08. Liptinite-rich, shaly sandstone consisting mostly of yellow-fluorescing Prasinophyte (P) alginite and some acanthomorphic acritarchs. Some lenses of fluoramorphinite with inclusions of yellow-fluorescing alginite were also observed (no image taken). Fluorescent light.

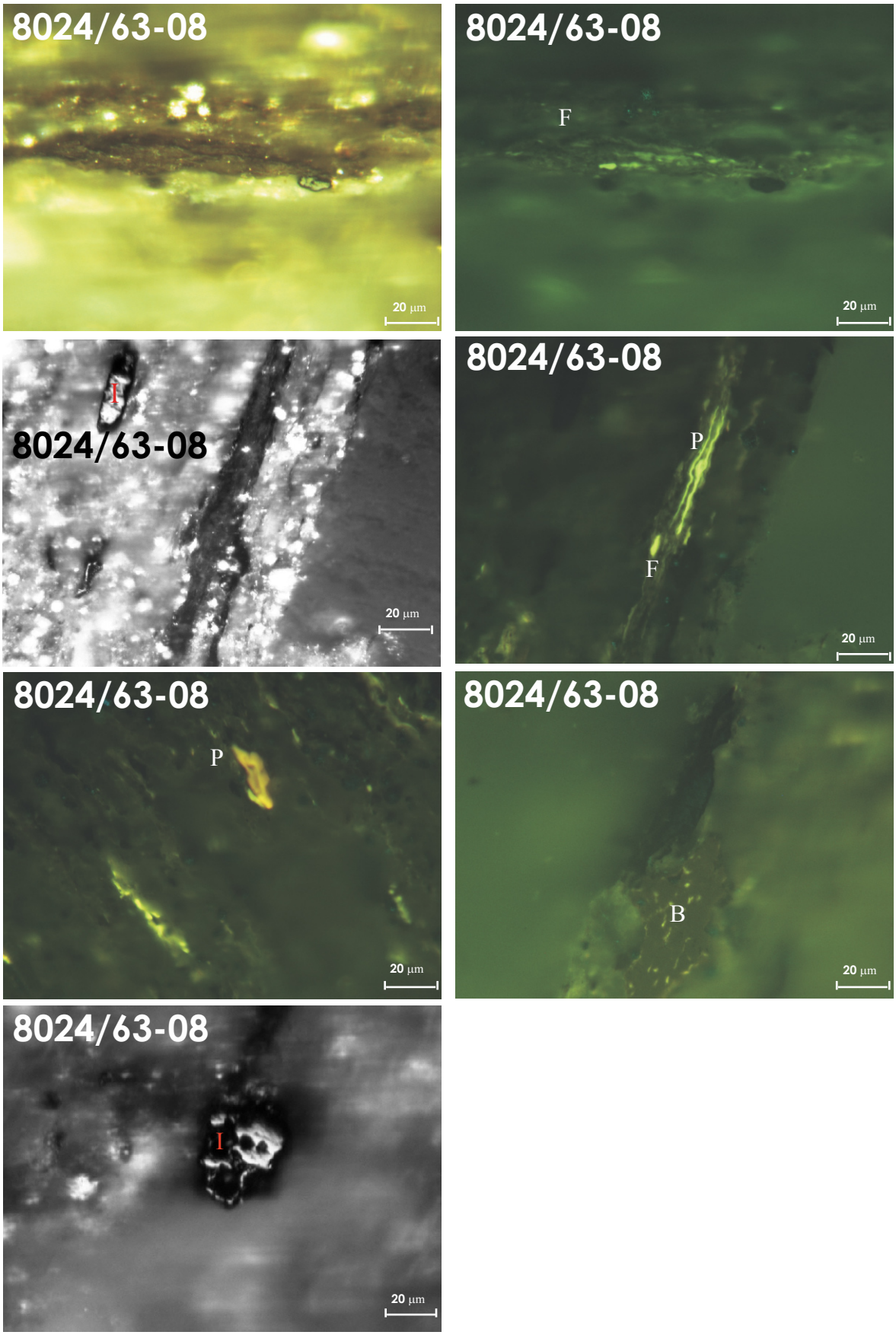




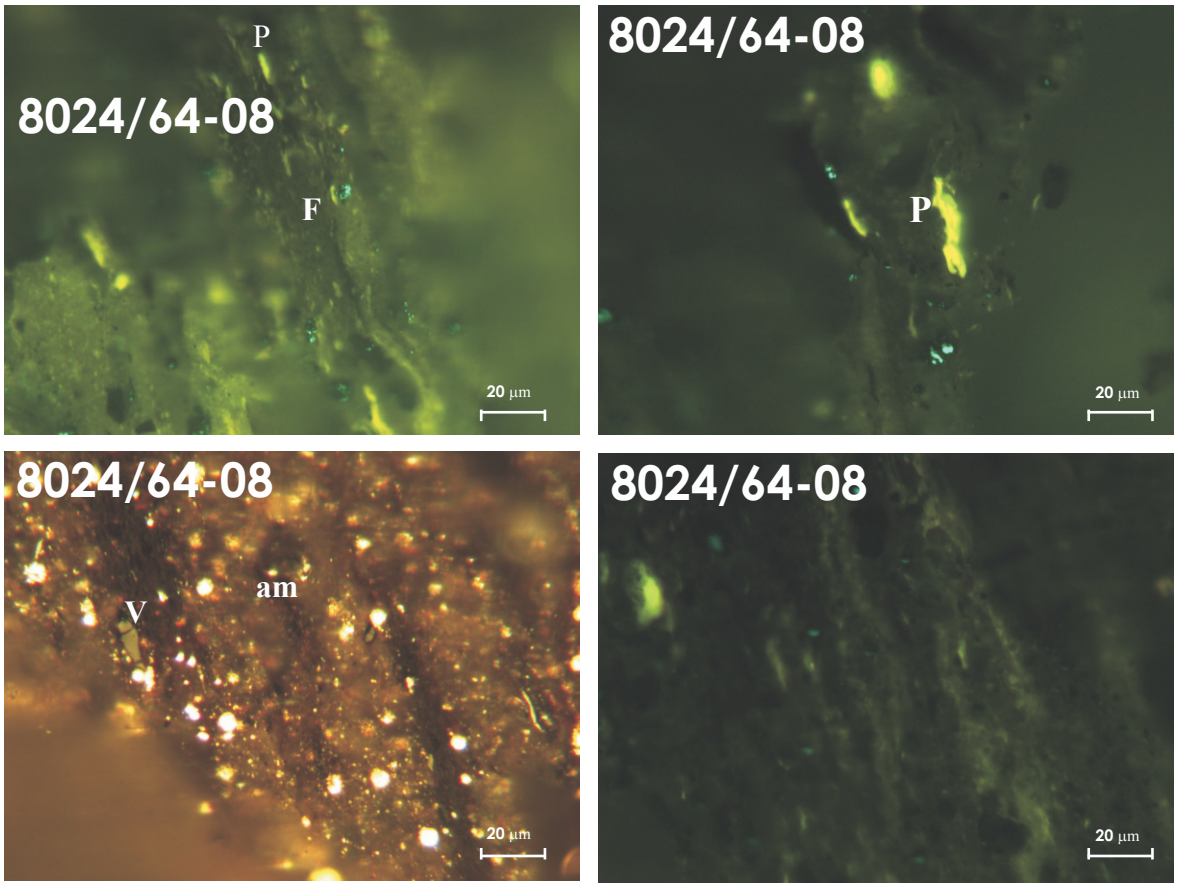




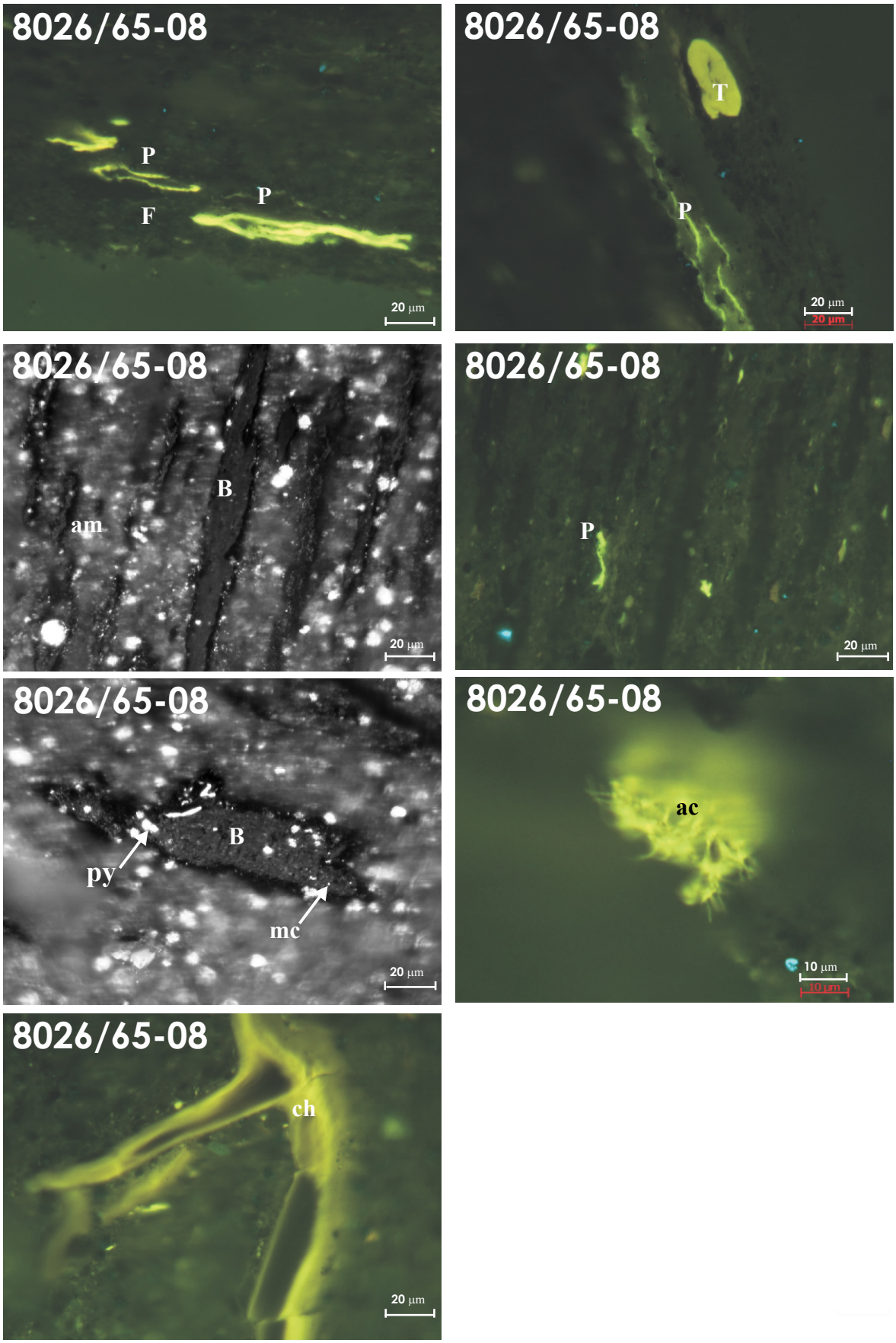
7343/11-08. Liptinite-rich mudstone consisting mostly of yellow-fluorescing Prasinophyte (P), *Tasmanites* (T) and botryococcus-like alginite. Some yellow aconthomorphic acritarchs. Some lenses of fluoramorphinite with yellow-fluorescing alginite inclusions (no image taken). Fluorescent light.



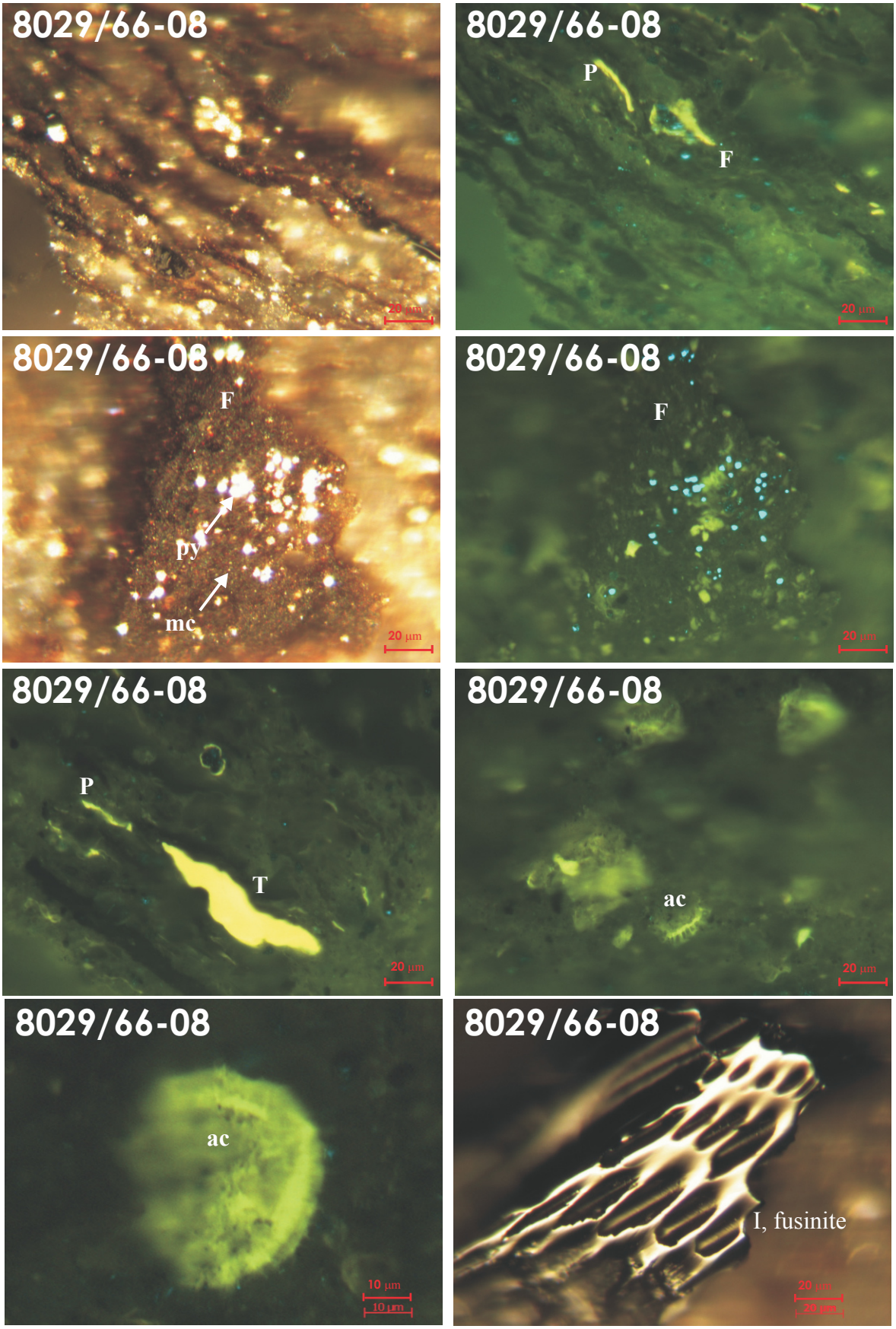
8024/63-08. Pyrite-rich shale with lenses of weak yellow to orange-fluorescing fluoramorphinite (F) with yellow-fluorescing alginite (mostly Prasinophyte (P) and liptodetrinite) inclusion, weak orange-fluorescing bitumen (B) and bright yellow-fluorescing bitumen. Also contains reworked vitrinite and inertinite (I) maceral. Fluorescent and reflected white light.



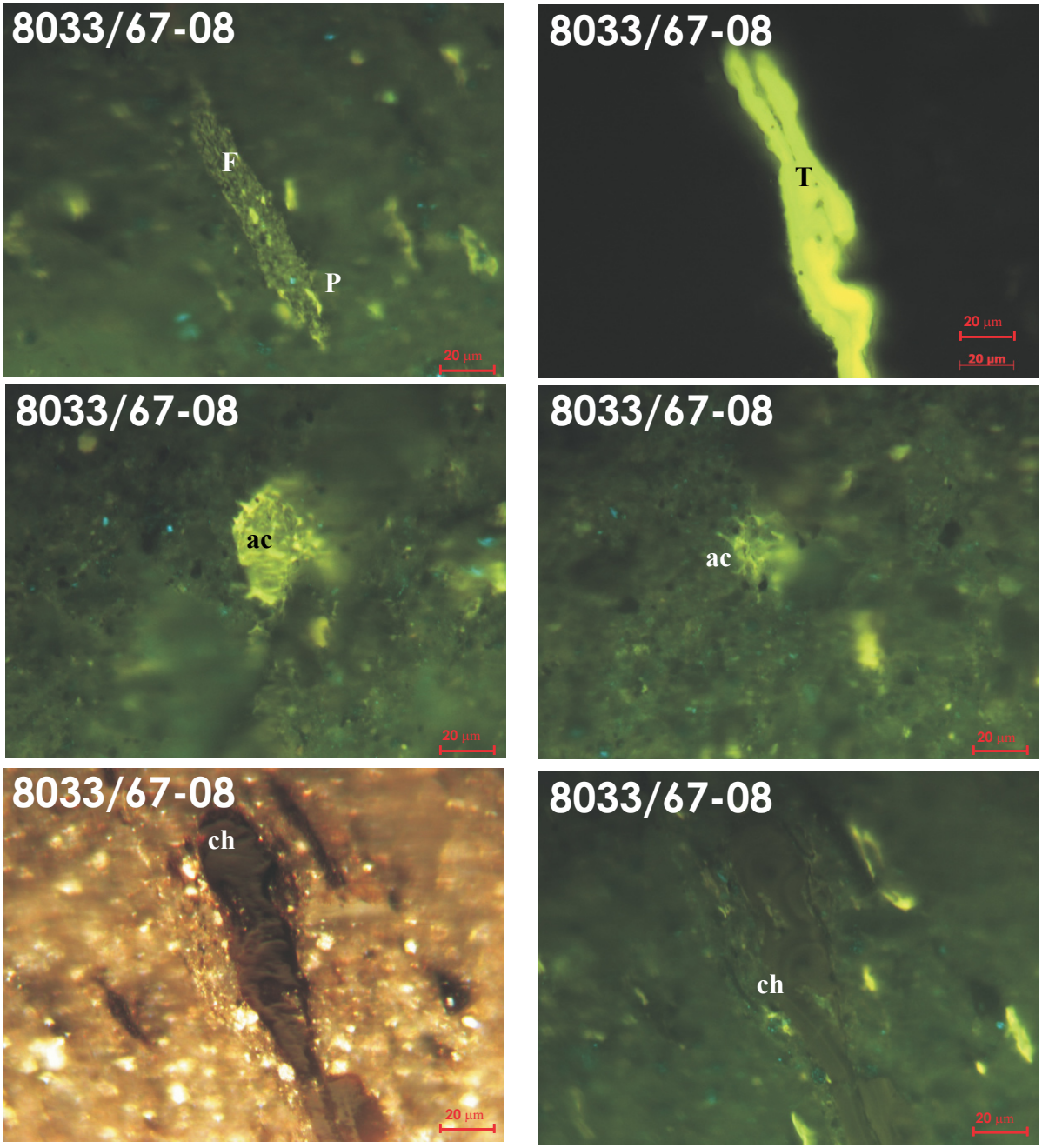
8024/64-08. Pyrite-rich shale with lenses of weak yellow to orange fluorescing fluoramorphinite (F) lenses with yellow fluorescing alginite (mostly Prasinophyte (P) and liptodetrinite) inclusion. Also contains reworked vitrinite (V) and inertinite maceral. Fluorescent and reflected white light. am = amorphous kerogen.



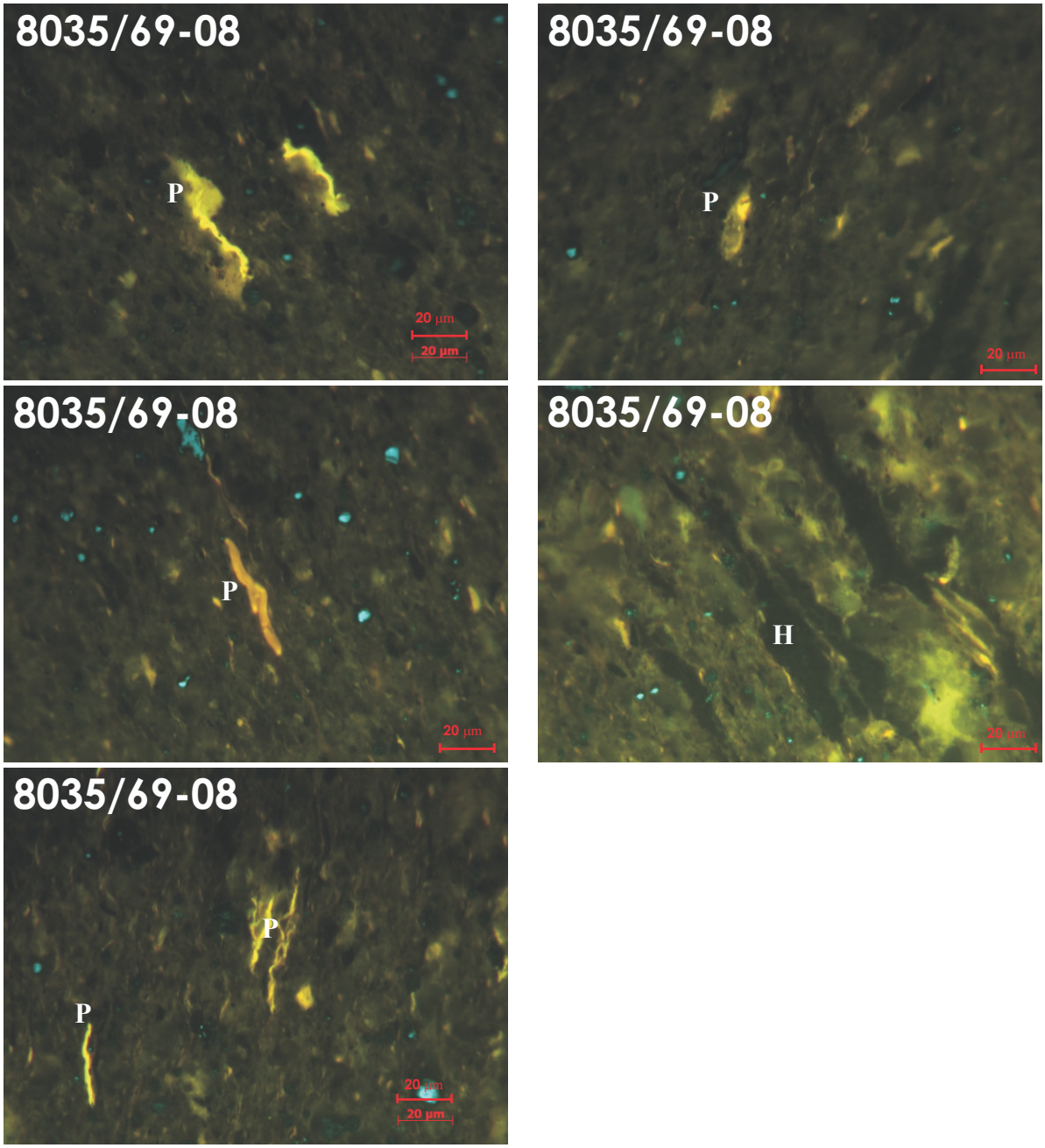
8026/65-08. Shale-rich in weak orange-fluorescing bituminite (B) with bright yellow-fluorescing liptodetrinite inclusion and grey granular bitumen with pyrite (py) and micrinite (mc) inclusion. Yellow-fluorescing alginite consisting mostly of Prasinophyte (P) and rare thick-walled *Tasmanites* (T) were also observed. Fluorescing acanthomorphic marine acritarch (ac) and chitinous (ch) fossils. Contains reworked inertinite maceral. Fluorescent and reflected white light. am = amorphous kerogen.



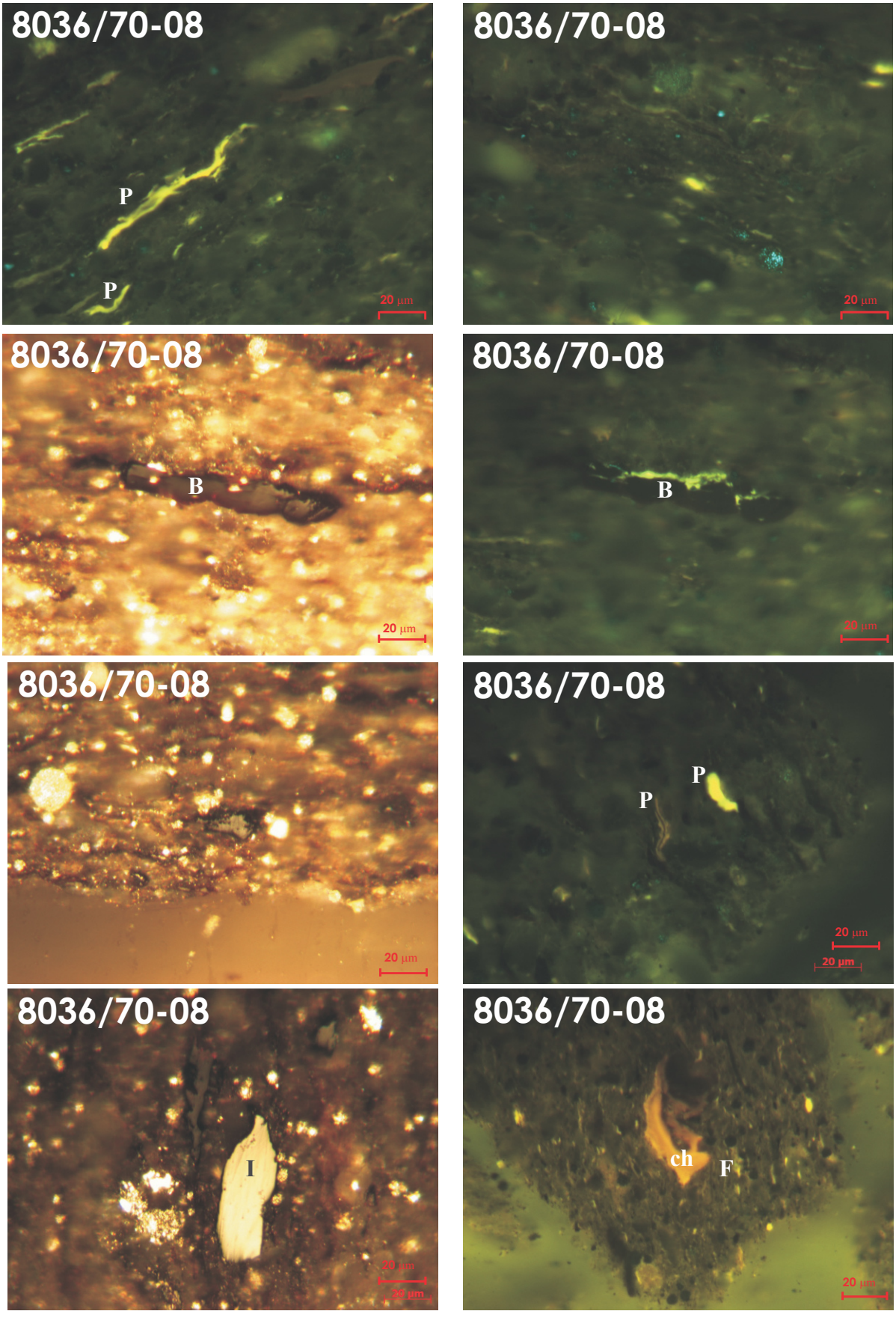
8029/66-08. Shale rich in pyrite-fluorescing fluoramophinite-matrix (F) bituminite with bright yellow fluorescing liptodetrinite. Also rich in yellow-fluorescing alginite consisting mostly of Prasinophyte (P), *Tasmanites* (T) with some acanthomorphic marine acritarch (ac). Chitinous fossils were observed. Reworked inertinite (I, fusinite) showing cellular wall structure were also observed. Fluorescence and reflected white light.



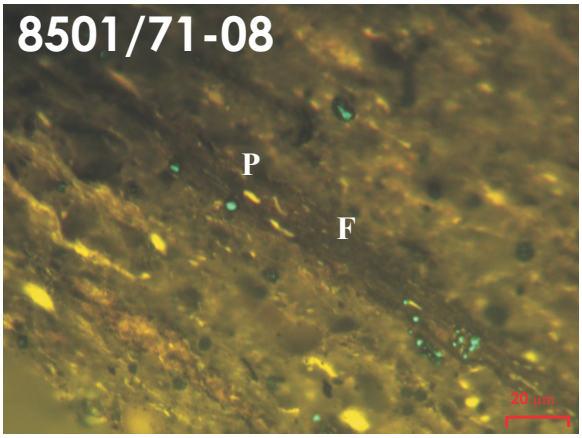
8033/67-08. Pyrite-rich shale with fluorescing fluoramophinite-matrix (F) bituminite with yellow fluorescing liptodetrinite. Rich in yellow-fluorescing alginite consisting mostly of Prasinophyte (P) with some *Tasmanities* (T) and acanthomorphic marine acritarch (ac). Chitinous fossils (ch) were observed. Fluorescent and reflected white light.

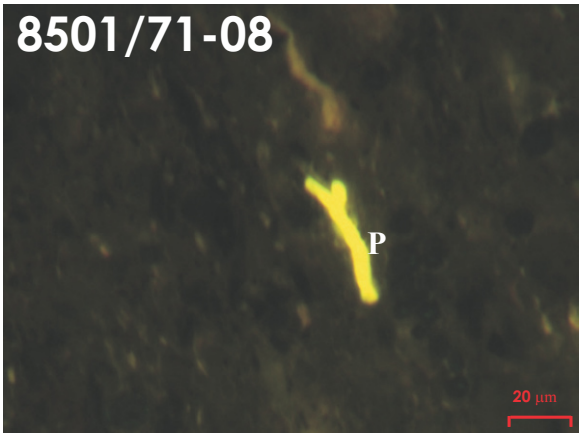


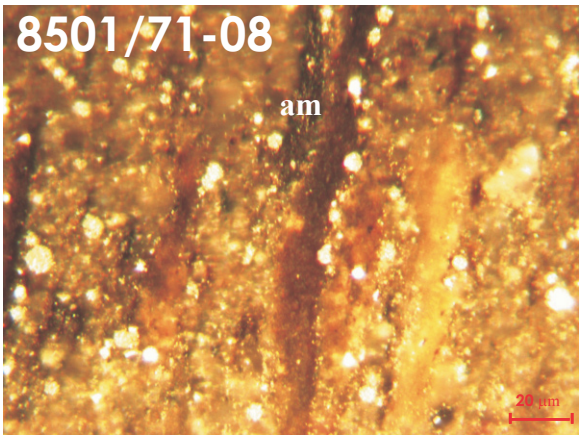
8035/69-08. Liptinite-rich shale consisting mostly of granular, grey, nonfluorescing hebamorphinite (H)-like kerogen and golden to dull yellow-fluorescing Prasinophyte alginite (P). Fluorescent light.

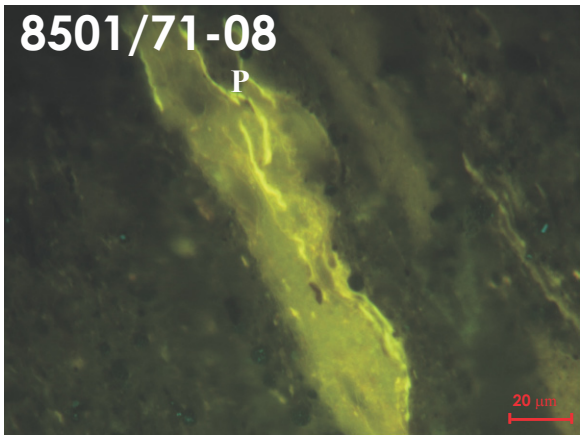


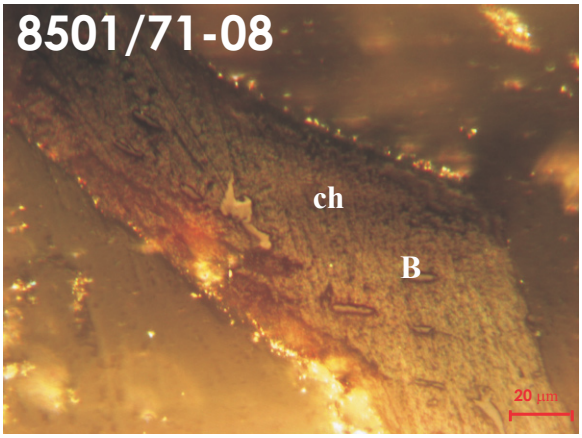
8036/70-08. Liptinite-rich shale consisting mostly of amorphous kerogen with some yellow-fluorescing Prasinophyte alginite (P), nonfluorescing solid bitumen (B) with brightly fluorescing bitumen. Some weakly fluorescing fluoramorphinite (F) with yellow-fluorescing alginite inclusion. Weakly fluorescing bituminite associated with pyrite and solid bitumen were also observed. ch = chitinous fragment.

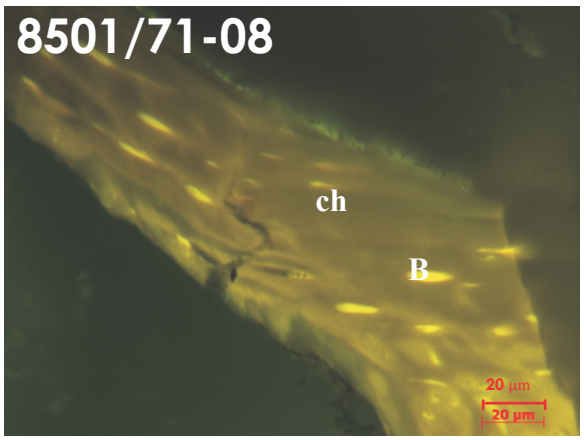


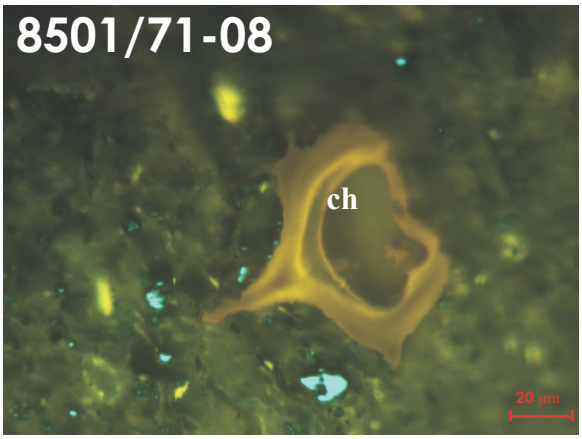




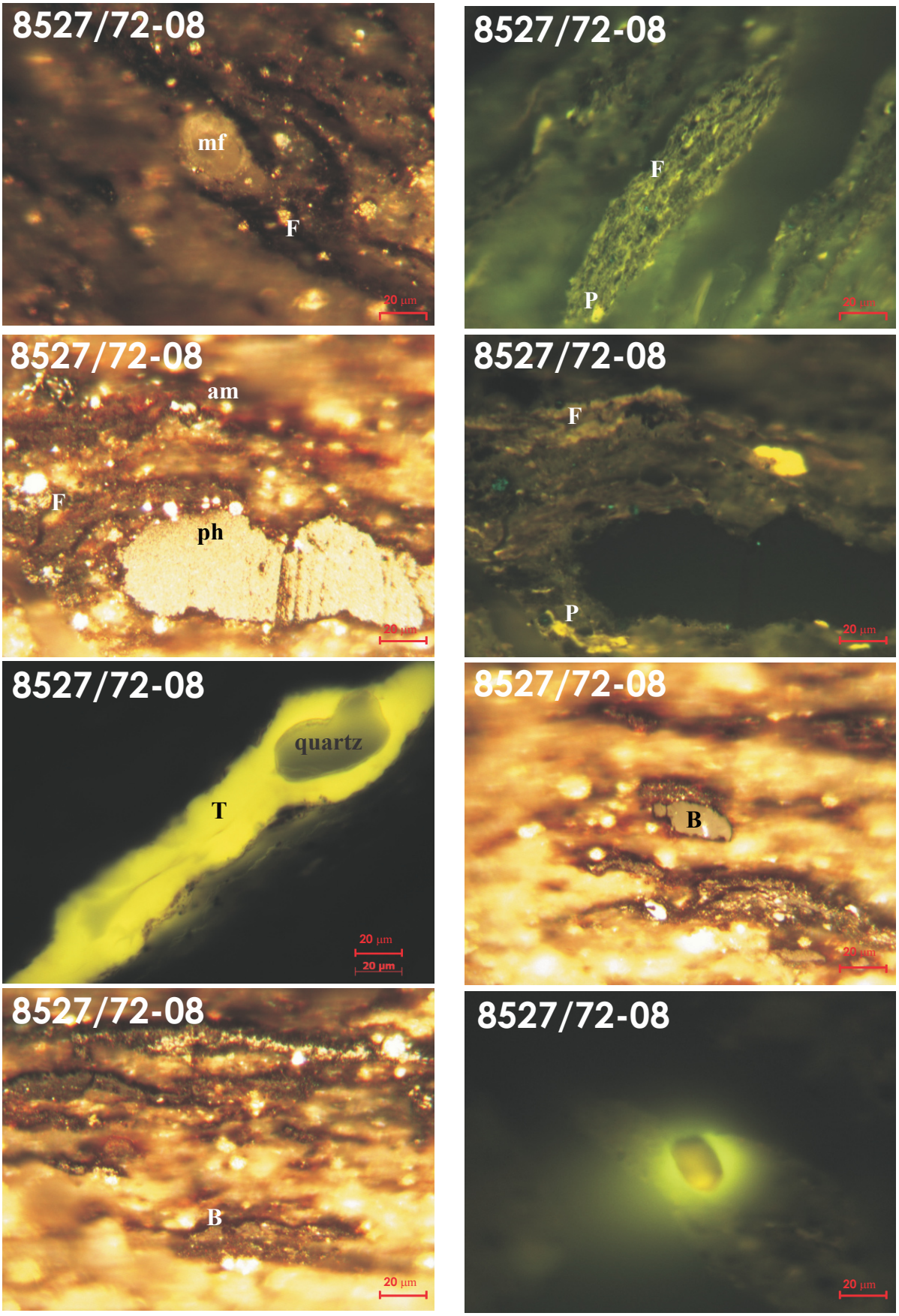




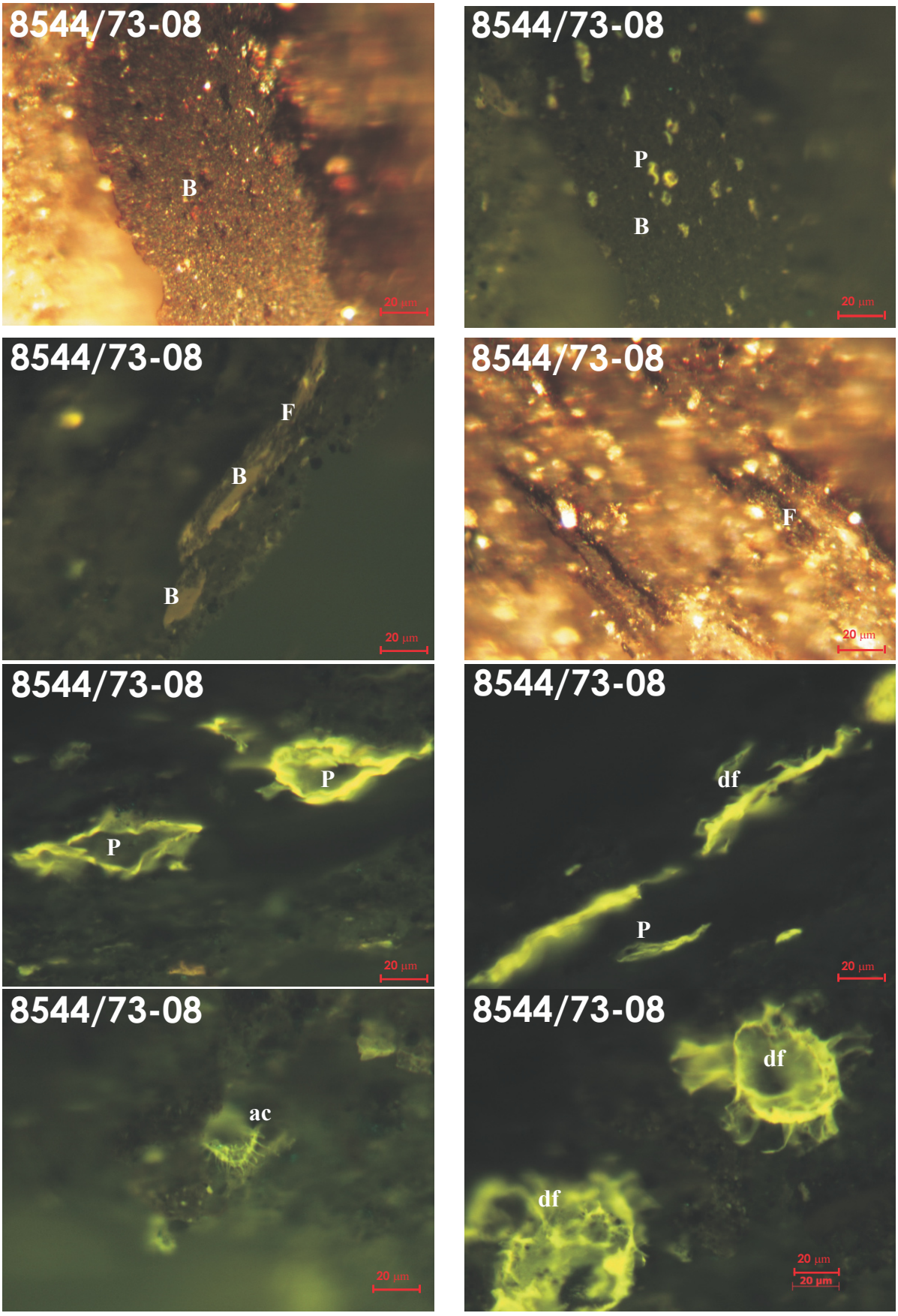




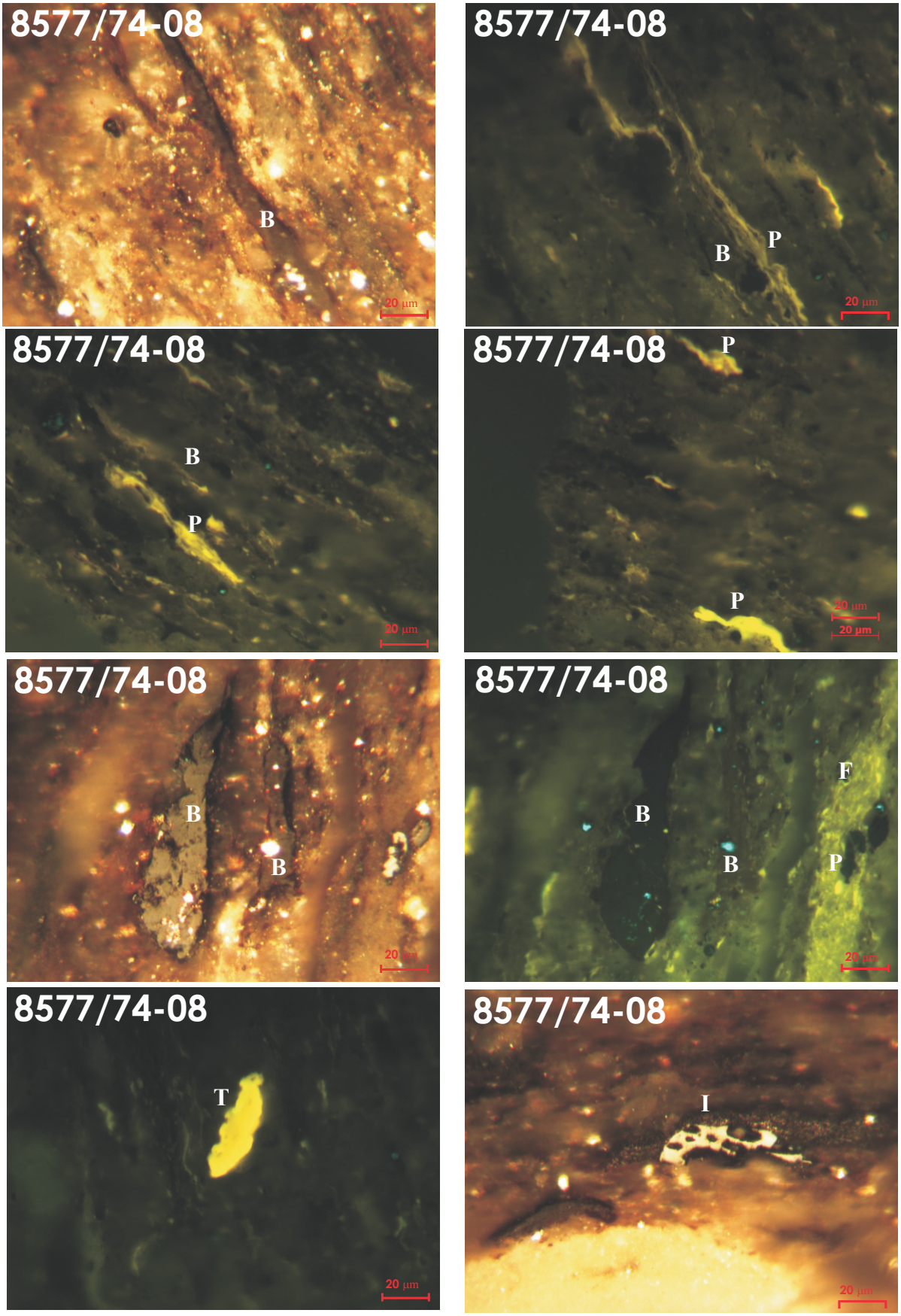
8501/71-08. Pyrite and liptinite-rich shale. Mostly weakly fluorescing fluoramorphinite-matrix (F) bituminite with yellow-fluorescing Prasinophyte (P) alginite and liptodetrinite inclusion. Lenses of amorphous kerogen (am), chitinous microfossils (ch) with bitumen-filled (B) micropores, possibly derived from crustacean or chitinozoans, and solid bitumen were also observed. Fluorescent and reflected white light.



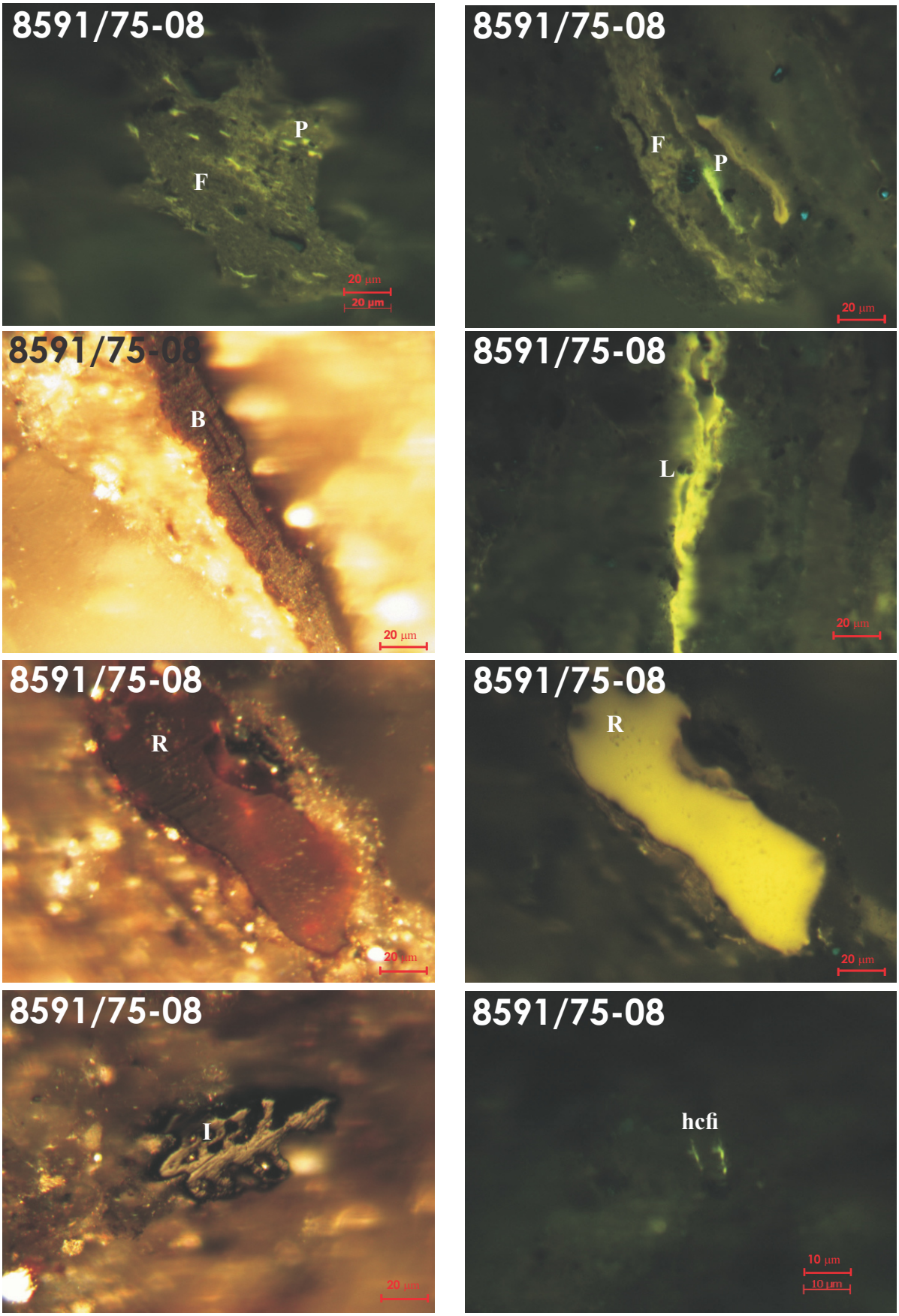
8527/72-08. Pyrite-rich shale with high amounts of interconnected networks of nonfluorescing and fluorescing hebamorphinite and fluoramorphinite-matrix bituminite (F) with numerous inclusions of yellow-fluorescing alginite (mainly Prasinophyte (P) and rare, thick-walled Tasmanites (T) and microforams (mf)), and fluorescing to nonfluorescing globules of solid bitumen (B) (some are dissolved under UV light, viewed parallel and perpendicular to the bedding). Fluorescence and reflected white light.



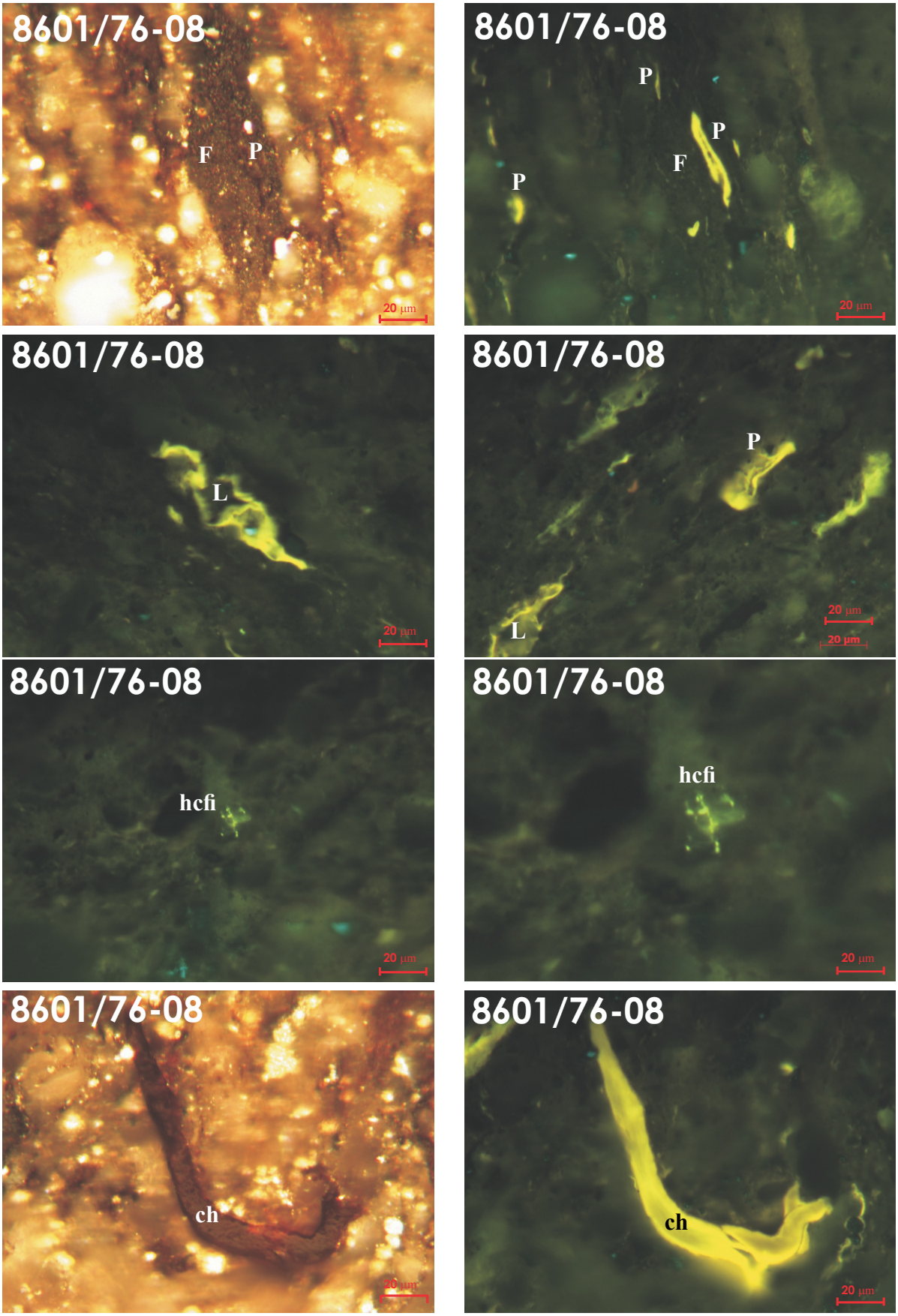
8544/73-08. Pyrite-rich shale with some lenses of fluorescing and nonfluorescing fluoramorphinite-matrix bituminite (F) with yellow fluorescing alginite inclusions (mainly Prasinophyte (P) and Leiosphaeridia) and weakly fluorescing, low-reflecting, solid bitumen (B). Some yellow fluorescing spiny acritarch (ac) and possibly dinoflagellates (df) were also observed.



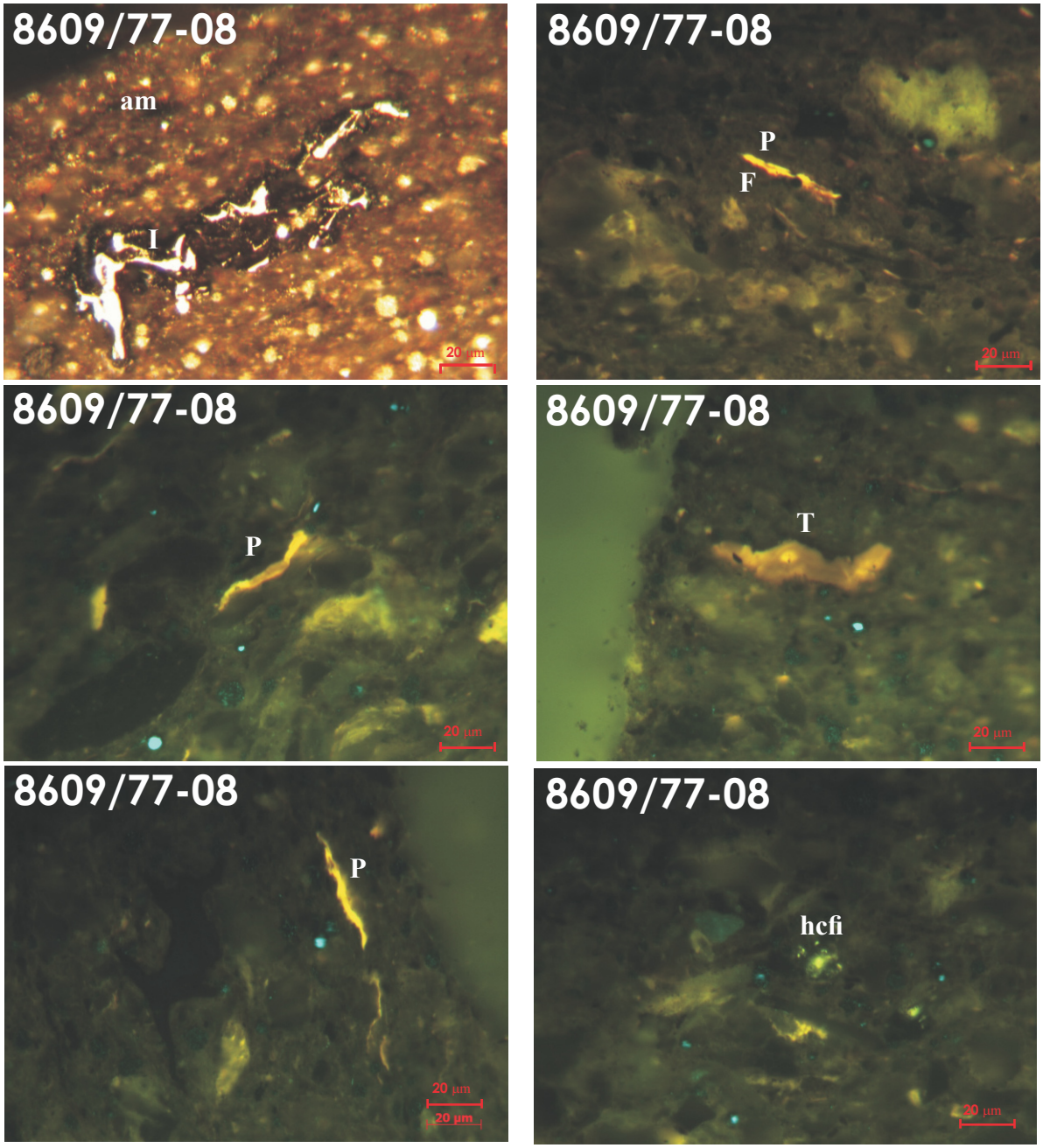
8577/74-08. Pyrite-rich shale with some lenses of fluorescing fluoramorphinite-matrix bituminite (F) with yellow-fluorescing alginite inclusions (mainly Prasinophyte (P) and rare *Tasmanites* (T)) and weakly fluorescing, low-reflecting, solid bitumen (B). Reworked inertinite (I) maceral were also observed. Fluorescent and reflected white light.



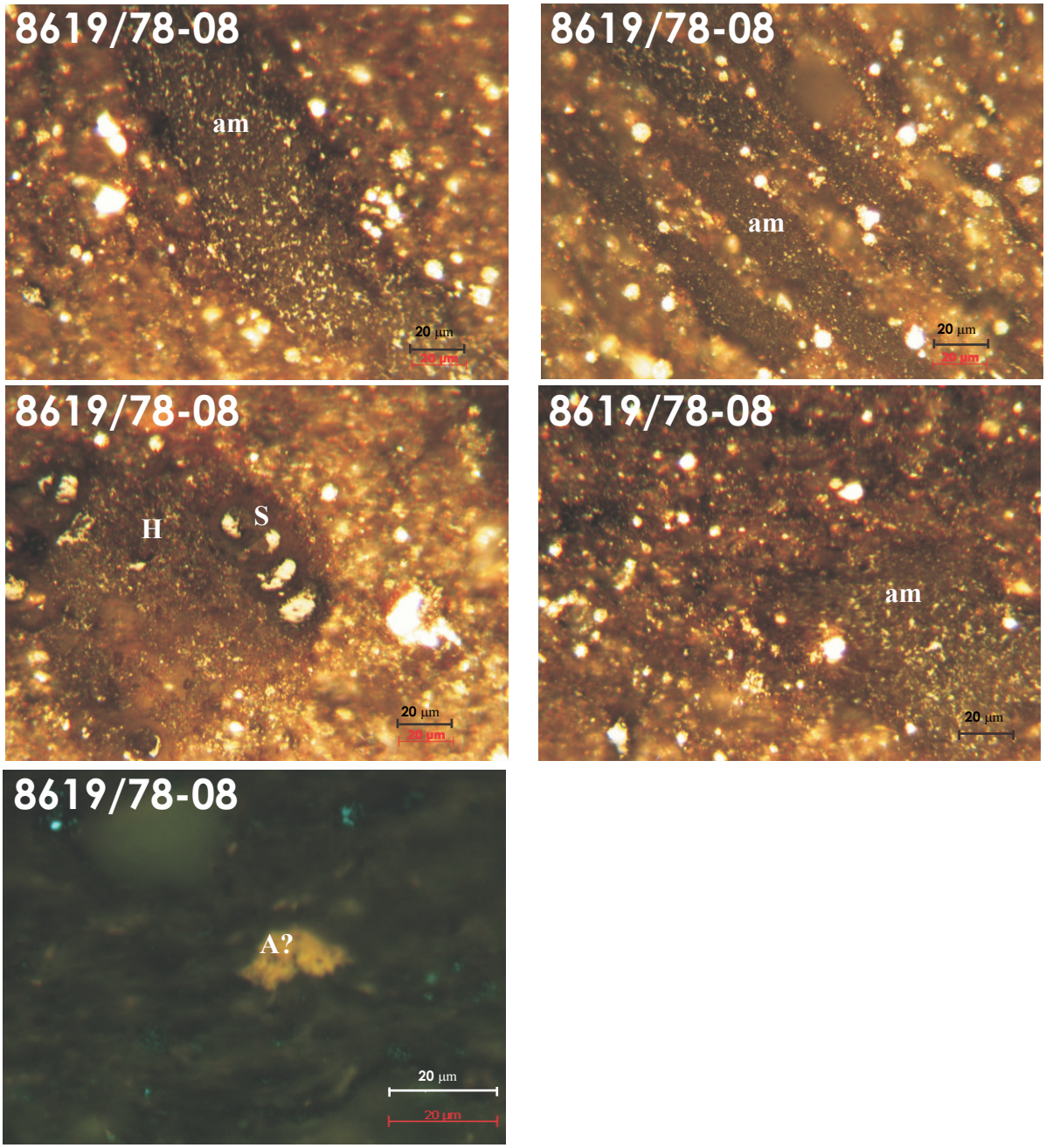
8591/75-08. Similar to 8577/74-08 but with slightly higher reworked maceral (inertinite (I)) content. Pyrite-rich shale with some lenses of fluoramorphinite-matrix (F) bituminite with yellow fluorescing alginite inclusions (mainly Prasinophyte (P) and *Leiosphaeridia* (L)), weakly fluorescing, low-reflecting, solid bitumen (B) and rare hydrocarbon fluid-inclusions (hcfi) were also observed. R = resinite (a liptinite submaceral). Fluorescent and reflected white light.



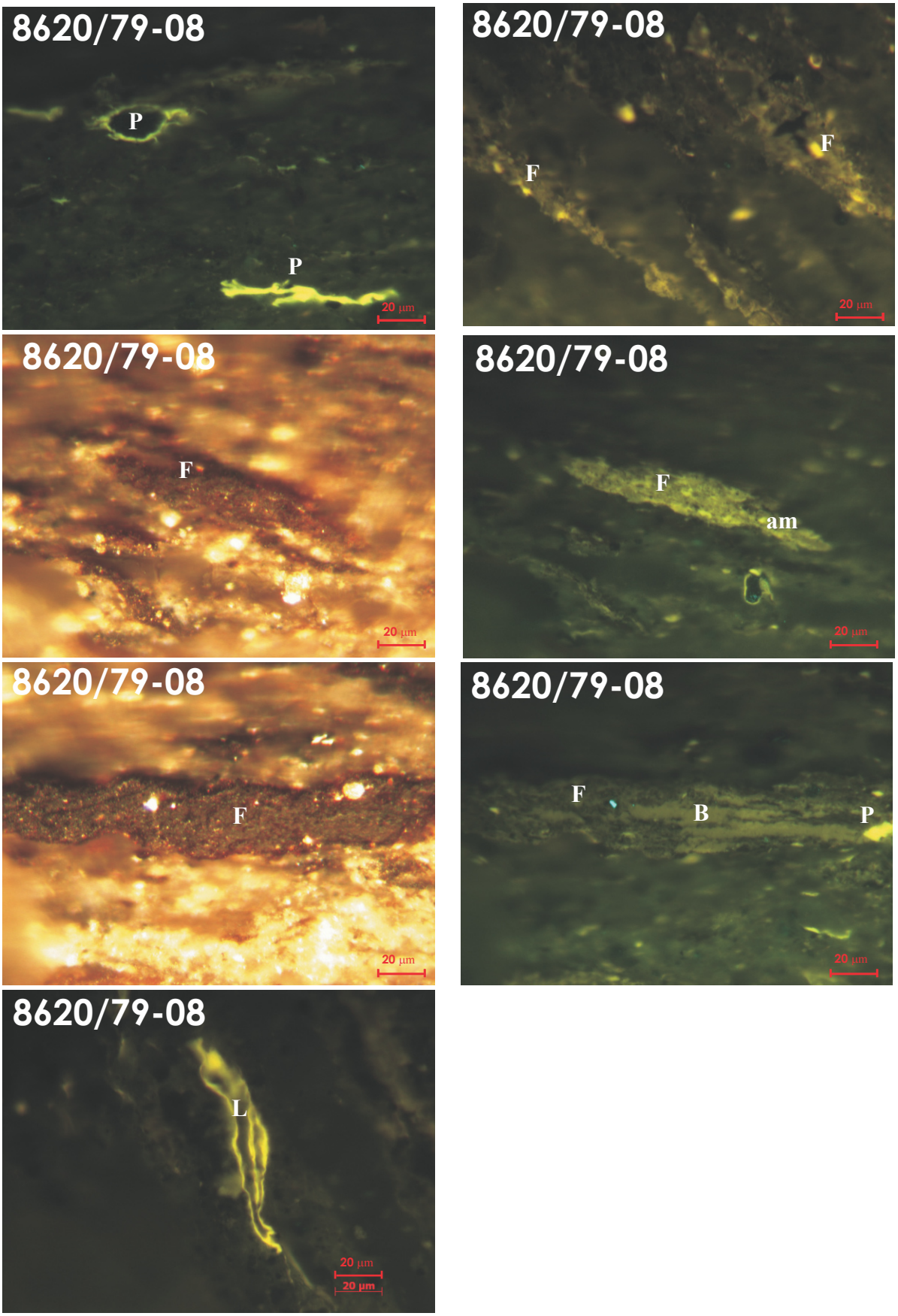
8601/76-08. Pyrite-rich black shale with some lenses of hebamorphinite and fluoramorphinite-matrix bituminite (F) with yellow-fluorescing alginite inclusions (mainly Prasinophyte (P) and *Leiosphaeridia* (L)), rare, yellow-fluorescing hydrocarbon fluid-inclusions (hcfi) annealed in quartz matrix and chitinous fossils (ch). Fluorescent and reflected white light.



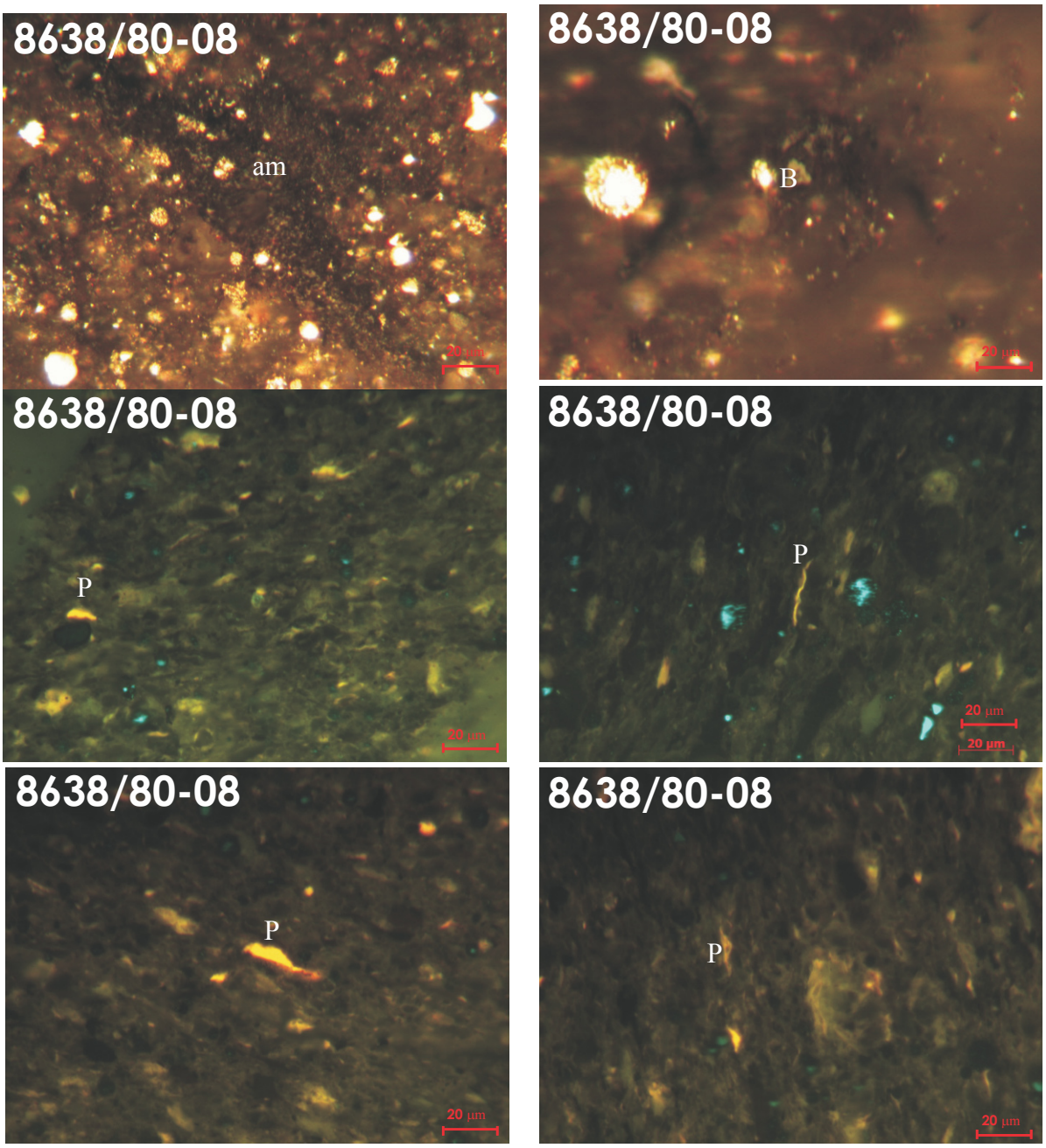
8609/77-08. Pyrite-rich, black shale with some amorphous kerogen (am), weakly fluorescing fluoramorphinite (F) with dull yellow-fluorescing alginite inclusions (mainly dull yellow-fluorescing Prasinophyte (P) and rare, thick-walled *Tasmanites*-like (T) alginite). Rare hydrocarbon fluid inclusions (hcfi) were also observed annealed in a quartz matrix. Fluorescent and reflected white light. I = Inertinite.



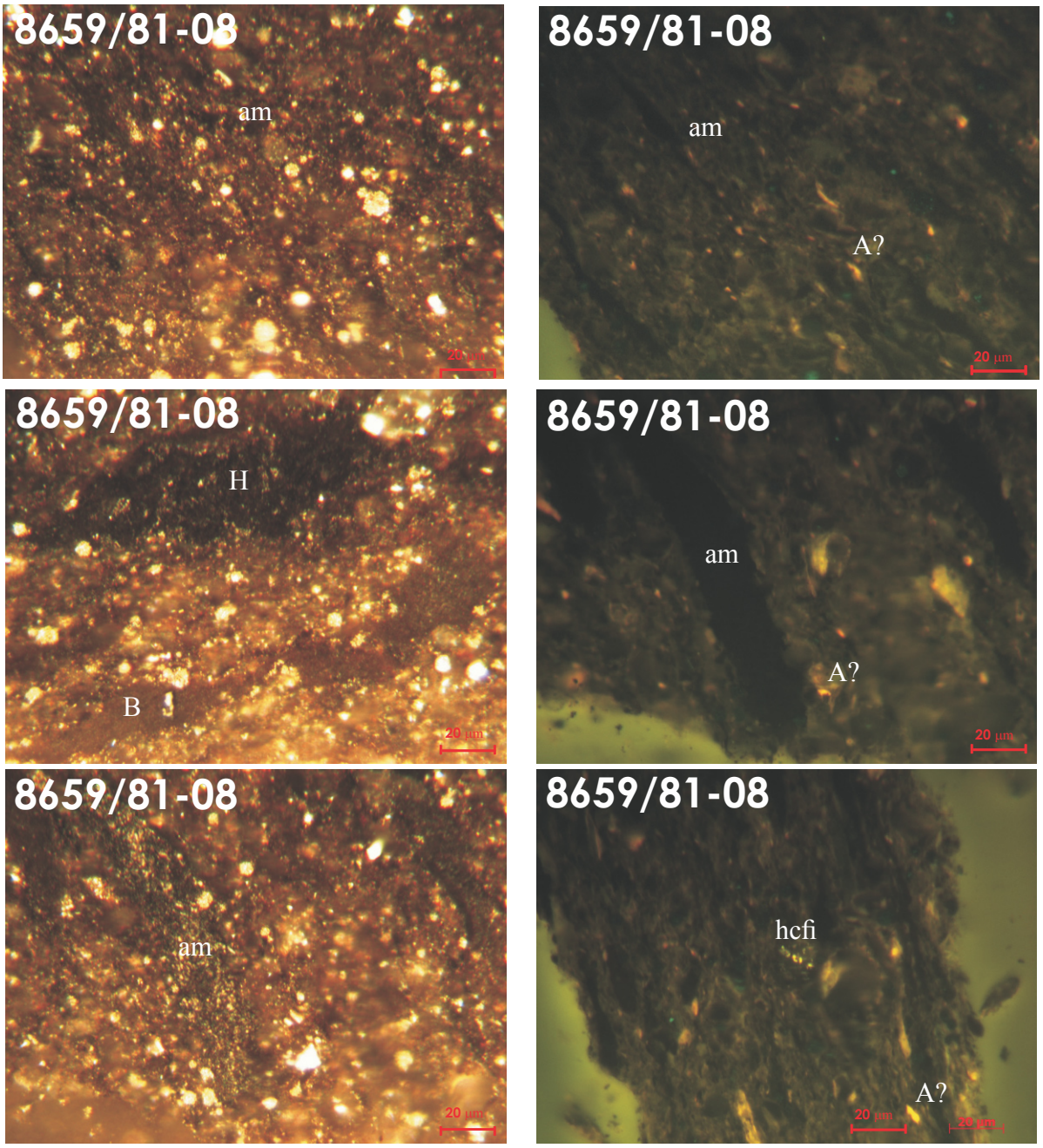
8619/78-08. Pyrite-rich, black mudstone. The organic matter content consists of amorphous kerogen (am); nonfluorescing amorphinite lenses; nonfluorescing, granular hebamorphinite (H); siliceous microfossils (S); and weak, dull yellow-orange fluorescing alginite species unknown (A?). Fluorescent and reflected white light.



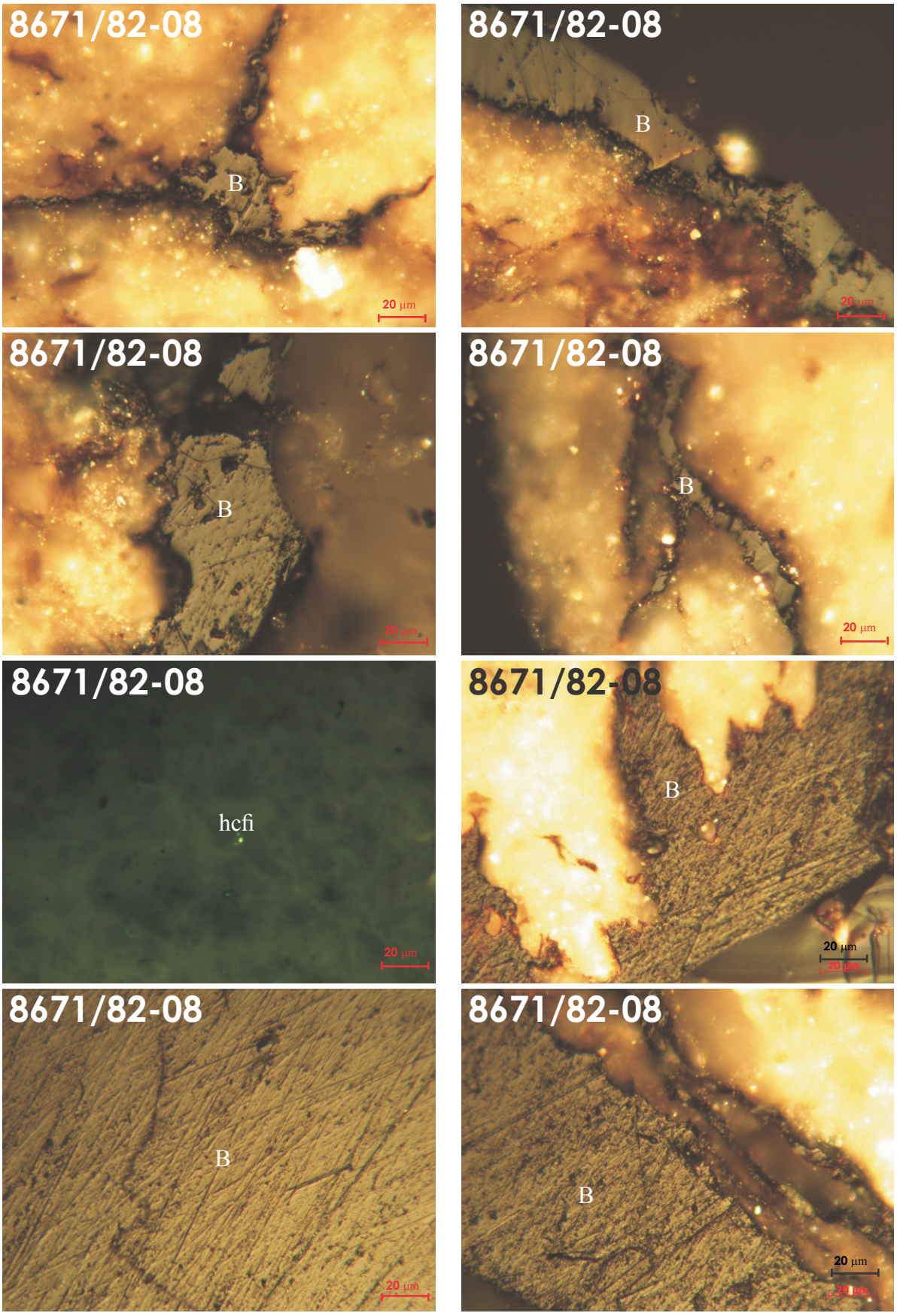
8620/79-08. Liptinite-rich, silty shale with some fluoramorphinite-matrix (F) bituminite with yellow-fluorescing alginite inclusions (mainly Prasinophyte (P) and weakly fluorescing granular bitumen (B) = 0.300 %Ro). *Leiosphaeridia* alginite (L). Fluorescent and reflected white light.



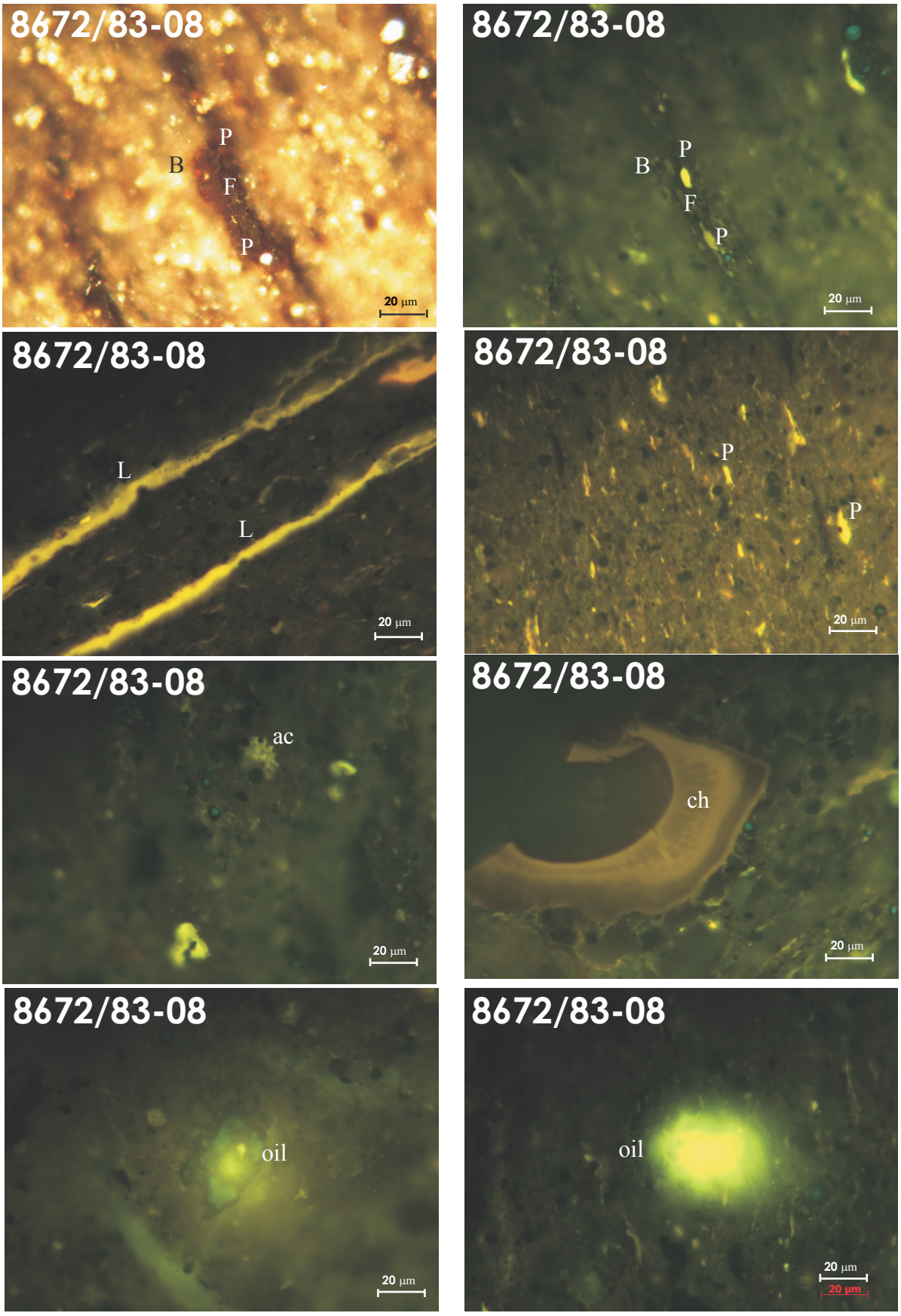
8638/80-08. Pyrite-rich, black mudstone with high content of reworked inertinite maceral. The indigenous population of organic matter are mainly amorphous kerogen (am), nonfluorescing hebamorphinite, small lenses of nonfluorescing amorphinite and rare, nonfluorescing, solid bitumen (B). Dull yellow to orange fluorescing Prasinophyte (P) alginite are the main liptinite population. Fluorescent and reflected white light.



8659/81-08. Pyrite-rich shale with high concentrations of phosphatic, granular grey matter (hebamorphinite (H?)) from bacterial remains and spent amorphous kerogen (am), some with solid and granular bitumen (B) inclusions, and dull yellow to orange-fluorescing alginite (A?). Rare, yellow-fluorescing hydrocarbon fluid-inclusions (hcfi) were also observed. Fluorescent and reflected white light.



8671/82-08. Bitumen-rich carbonates. Isotropic, nonfluorescing bitumen (B) have migrated into carbonate fractures and pores. Rare, yellow-fluorescing hydrocarbon fluid-inclusions (hcfi) annealed into quartz mineral. Fluorescent and reflected white light.



8672/83-08. Alginite and pyrite-rich shale with high concentrations of hebamorphinite and fluoramorphinite-matrix bituminite (F) with bright, yellow-fluorescing alginite (predominantly Prasinophyte (P) *Leiosphaeridia* (L) or filamentous alginite) and bitumen inclusions, spiny acanthomorphic acritarch (ac), and fluorescing chitinous matrix (ch). Yellow-fluorescing liquid oil is released when soluble bitumen is viewed under UV fluorescence. Fluorescent and reflected white light.