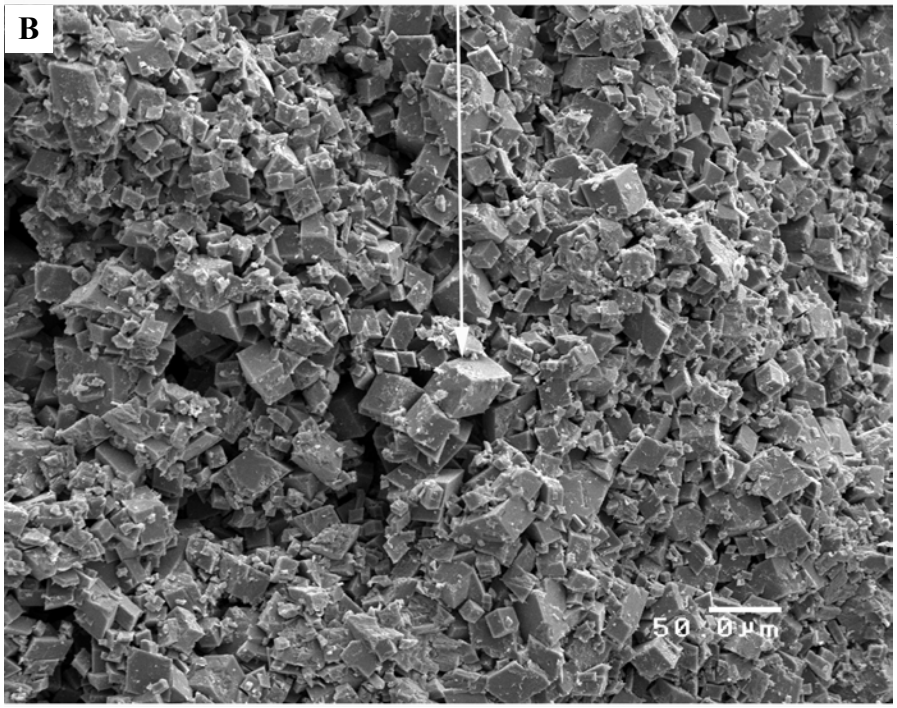
APPENDIX E:

SCANNING ELECTRON MICROSCOPY, EPIFLUORESCENCE, CATHODOLUMINESCENCE, AND FLUID INCLUSIONS, LISBON FIELD, SAN JUAN COUNTY, UTAH

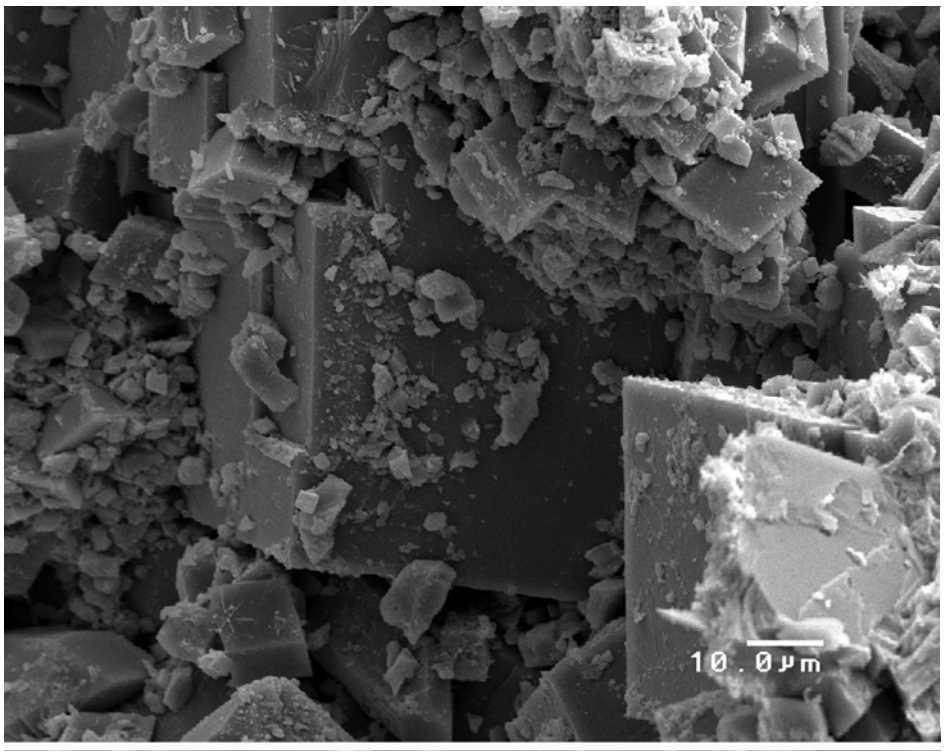
SCANNING ELECTRON MICROSCOPY

B-610 WELL,
LISBON FIELD

Photomicrograph 1A. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Overview of porous dolomite with intercrystalline-BC and moldic-MO porosity. Black is porosity. Cemented tight area (outlined) visible in right center. Center portion enlarged in photomicrograph 1B. Arrow points to same crystal in both views. Scale represents 200 microns (0.2 mm).

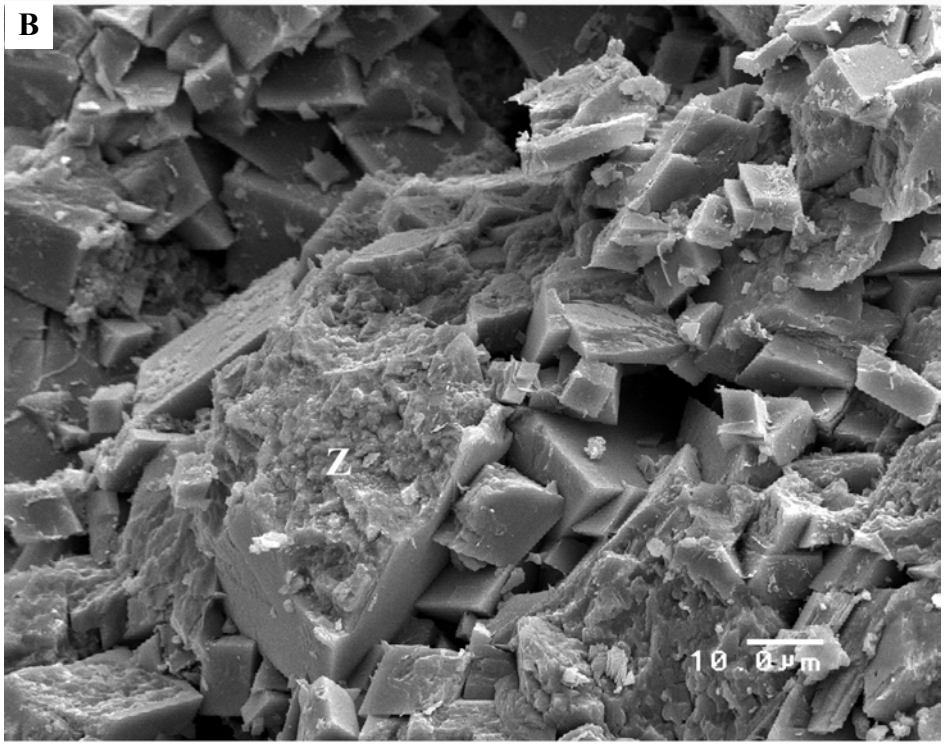


Photomicrograph 1B. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement of central portion of photomicrograph 1A showing detail of dolomite crystal size variation. Arrow points to same crystal in both views. Black is porosity. Scale represents 50 microns (0.05 mm).

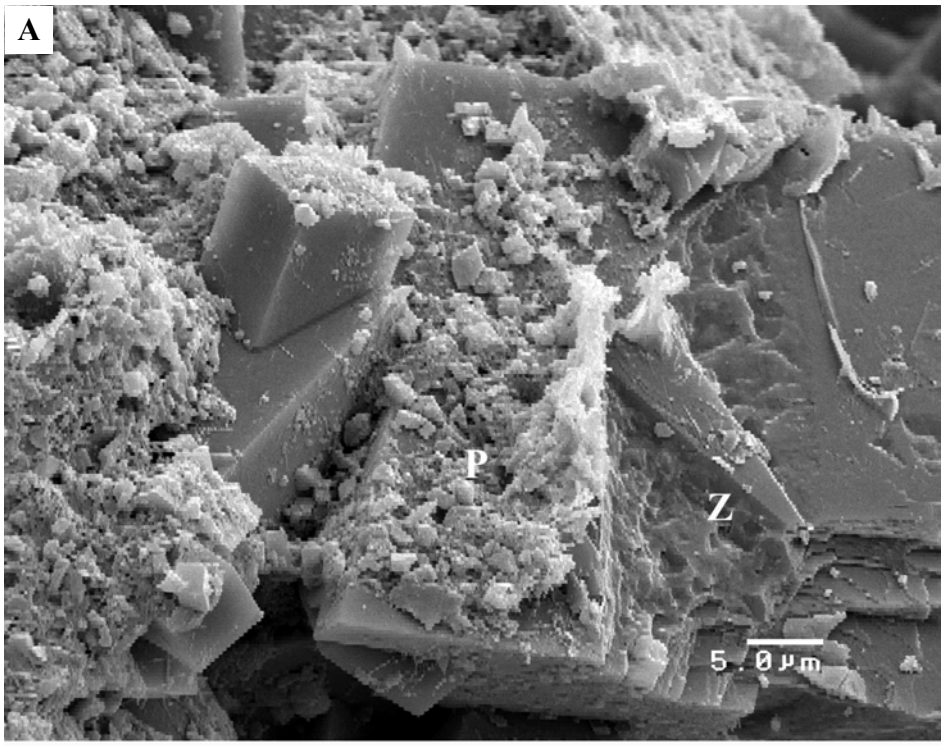


Photomicrograph 2. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement of dolomite crystals and pore system. Black is porosity. Scale represents 10 microns (0.01 mm).

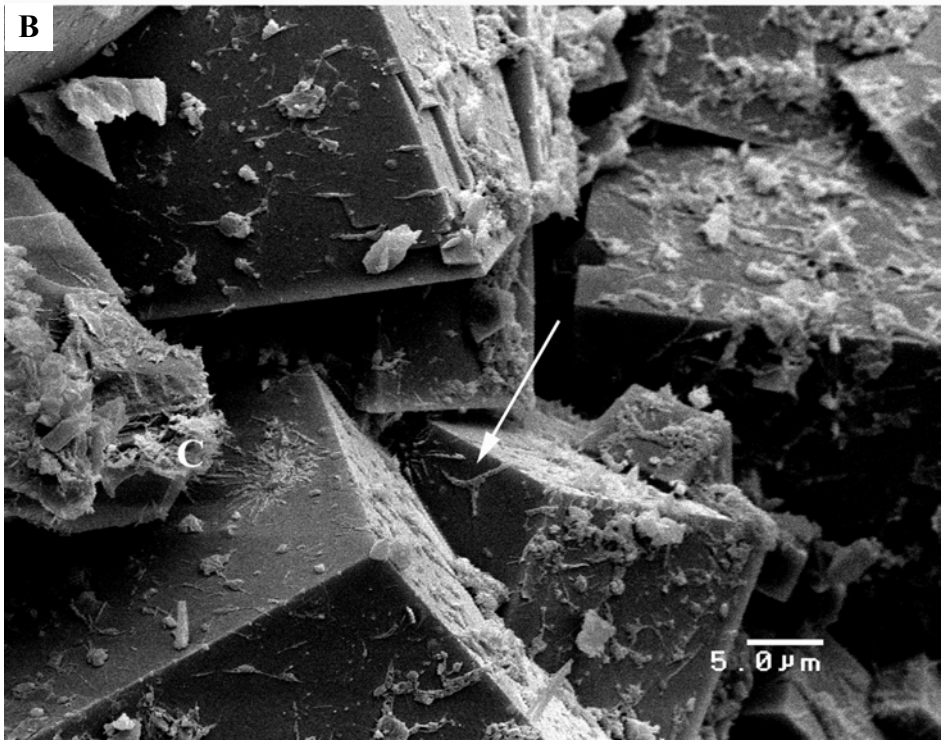
Photomicrograph 3A. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement showing rare calcite cement (C). Black is porosity. Scale represents 10 microns (0.01 mm).



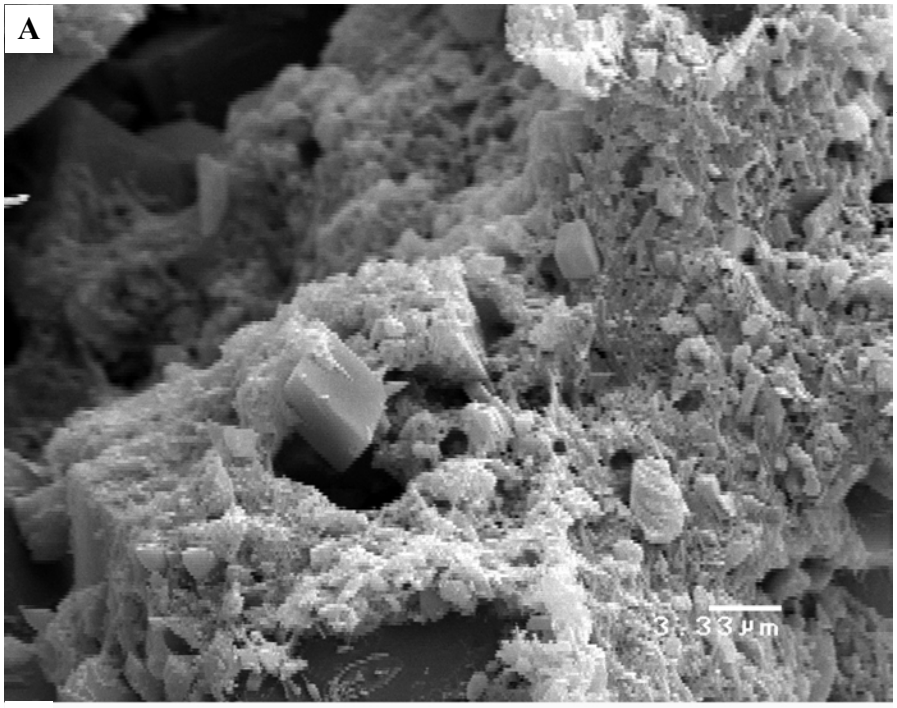
Photomicrograph 3B. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement showing zoned dolomite (Z). Porosity is black. Scale represents 10 microns (0.01 mm).



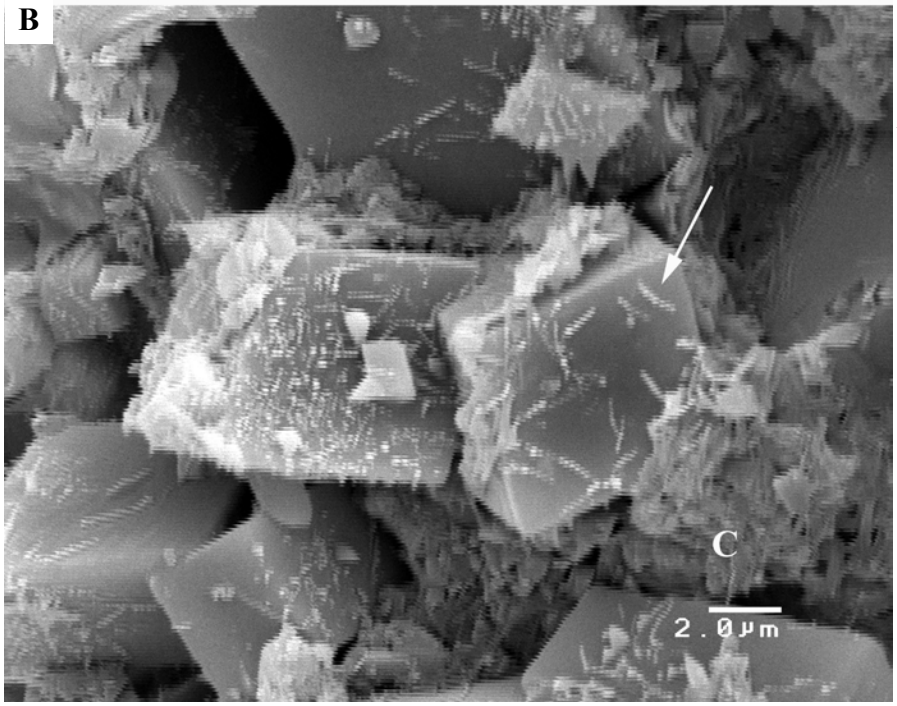
Photomicrograph 4A. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement showing zoned dolomite (Z). Possible pyrobitumen (P) visible. Black is porosity. Scale represents 5 microns (0.005 mm).



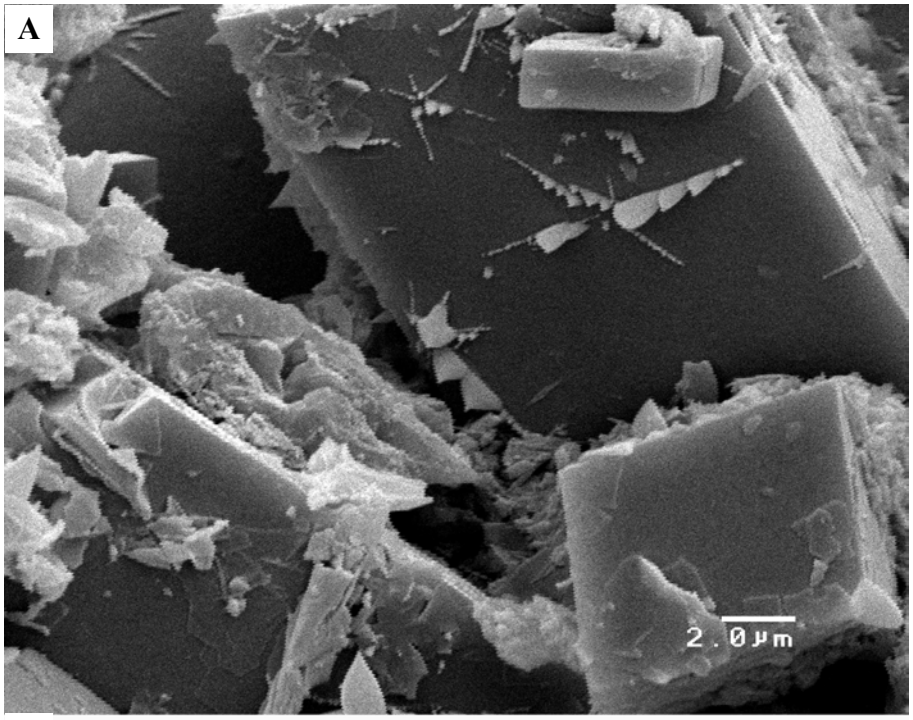
Photomicrograph 4B. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement of dolomite crystals with minor clays (C) and linear features that may be pyrobitumen or sulfides (arrow). Scale represents 5 microns (0.005 mm).



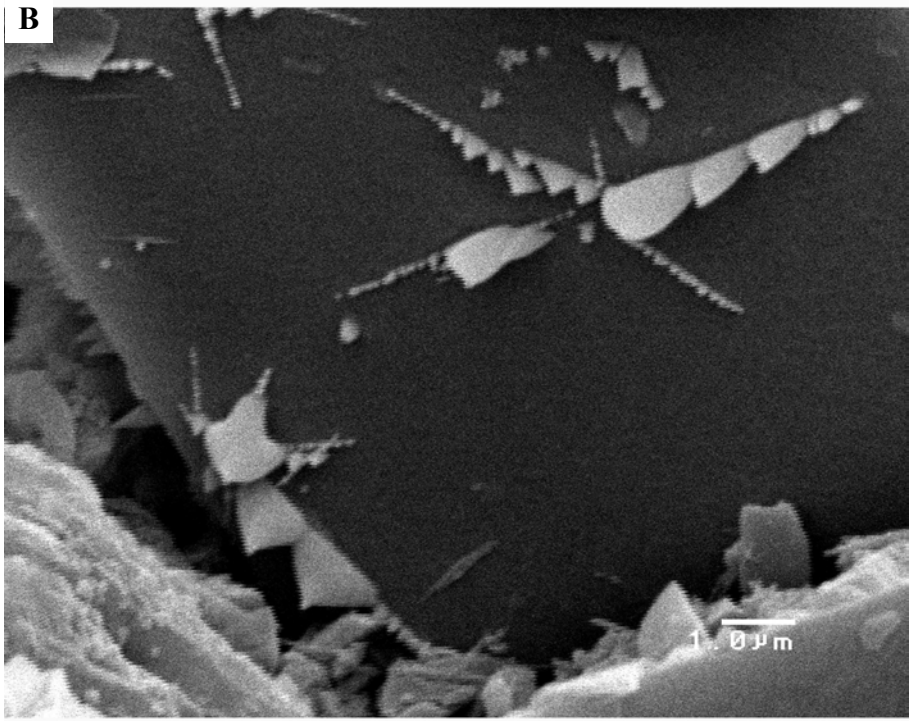
Photomicrograph 5A. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement showing dolomite and calcite cement coating dolomite crystal. Black is porosity. Scale represents 3.33 microns (0.003 mm).



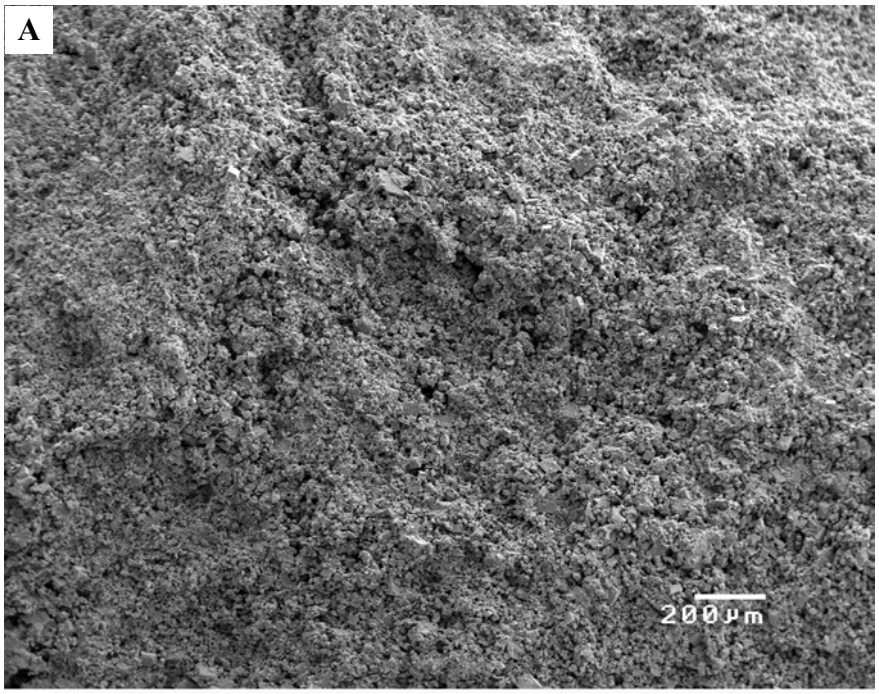
Photomicrograph 5B. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement of dolomite crystals with minor clays (C) and linear features that may be pyrobitumen or sulfides (arrow). Scale represents 2 microns (0.005 mm).



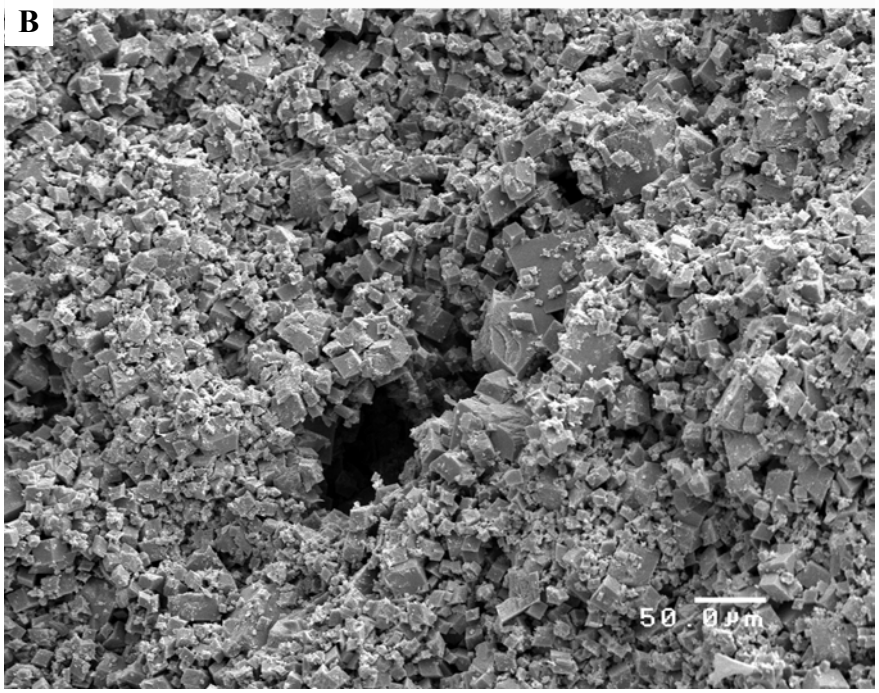
Photomicrograph 6A. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement showing linear features that may be pyrobitumen or sulfides. Loose crystal in upper right center is unidentified. Black is porosity. Scale represents 2 microns (0.002 mm).



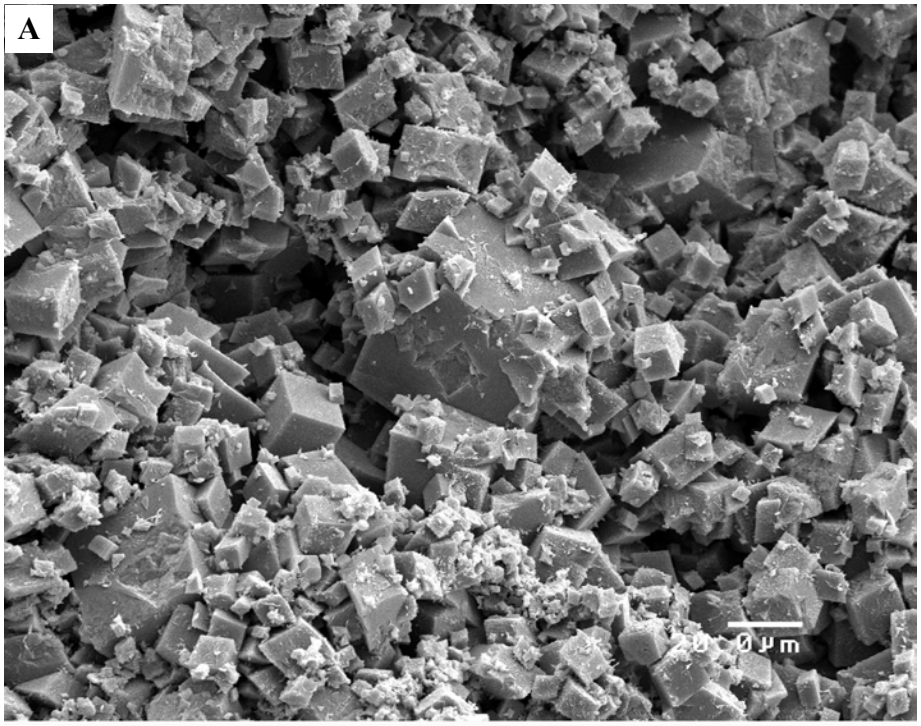
Photomicrograph 6B. Lisbon B-610. SEM photomicrograph of a core plug from 7886'. Enlargement of upper right crystal in photomicrograph 6A. Scale represents 1 microns (0.001 mm).



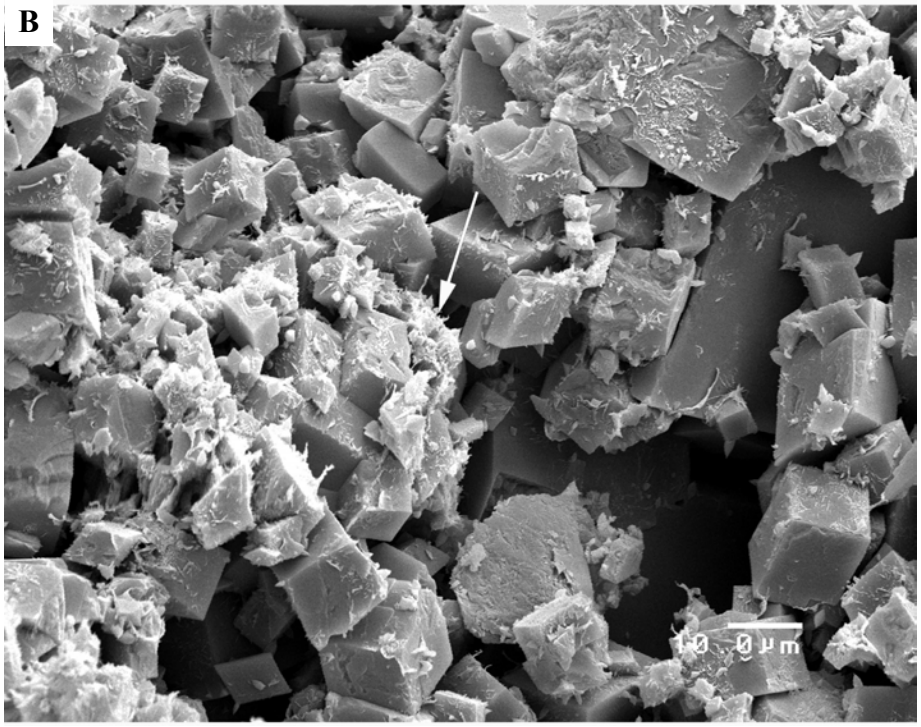
Photomicrograph 1A. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Overview of porous dolomite. Most porosity visible is inter-crystalline-BC porosity. Scale represents 200 microns (0.2 mm).



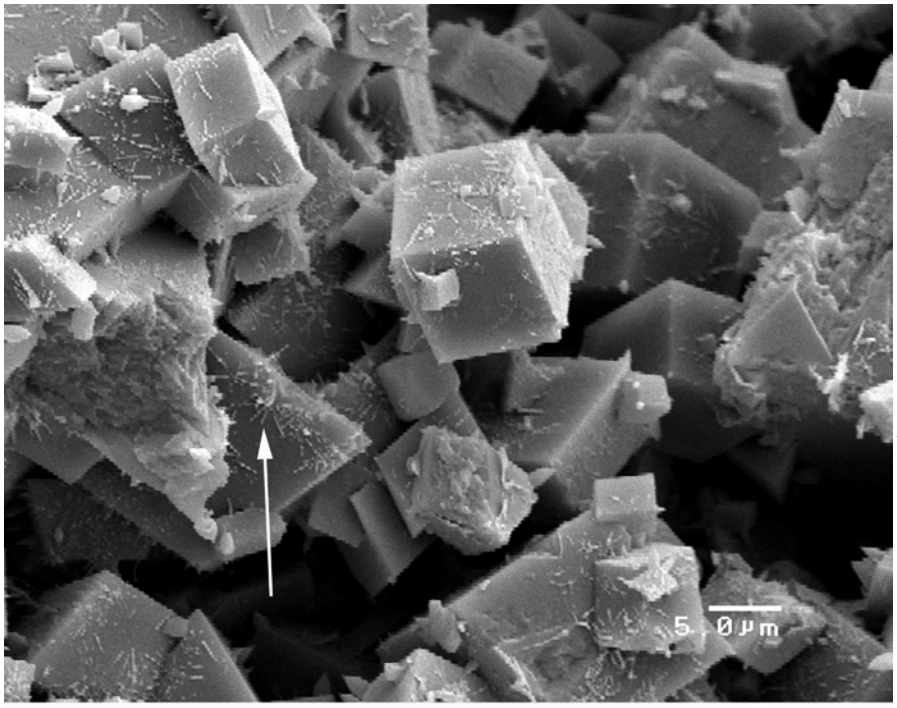
Photomicrograph 1B. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Intercrystalline microporosity-BC, with mesopore–VG visible in center. Black is porosity. Scale represents 50 microns (0.05 mm).



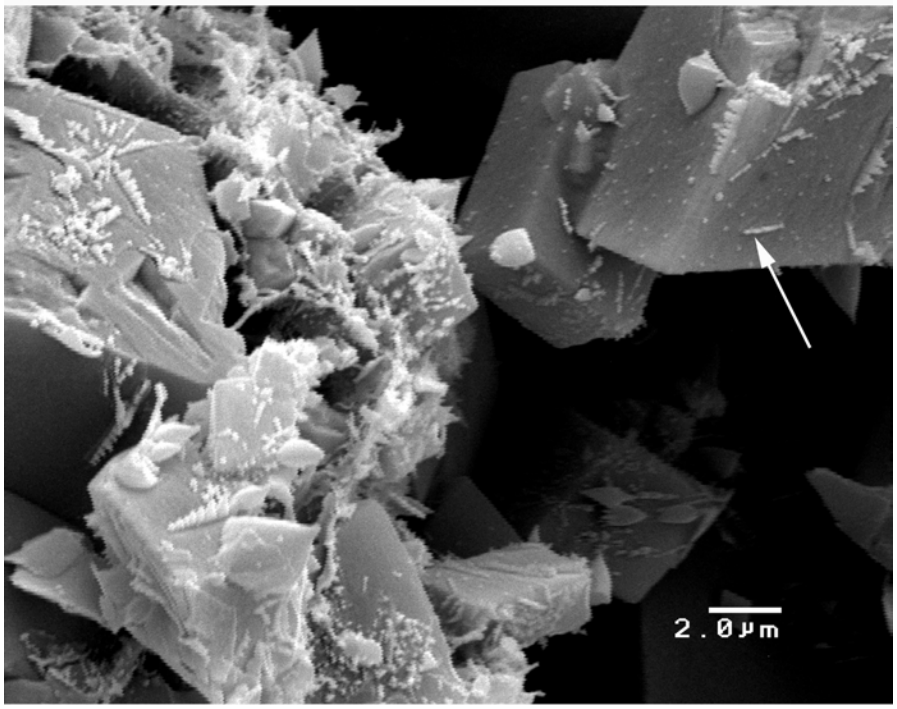
Photomicrograph 2A. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement of a massive area of interconnected intercrystalline micropores – BC (black). Scale represents 10 microns (0.01 mm).



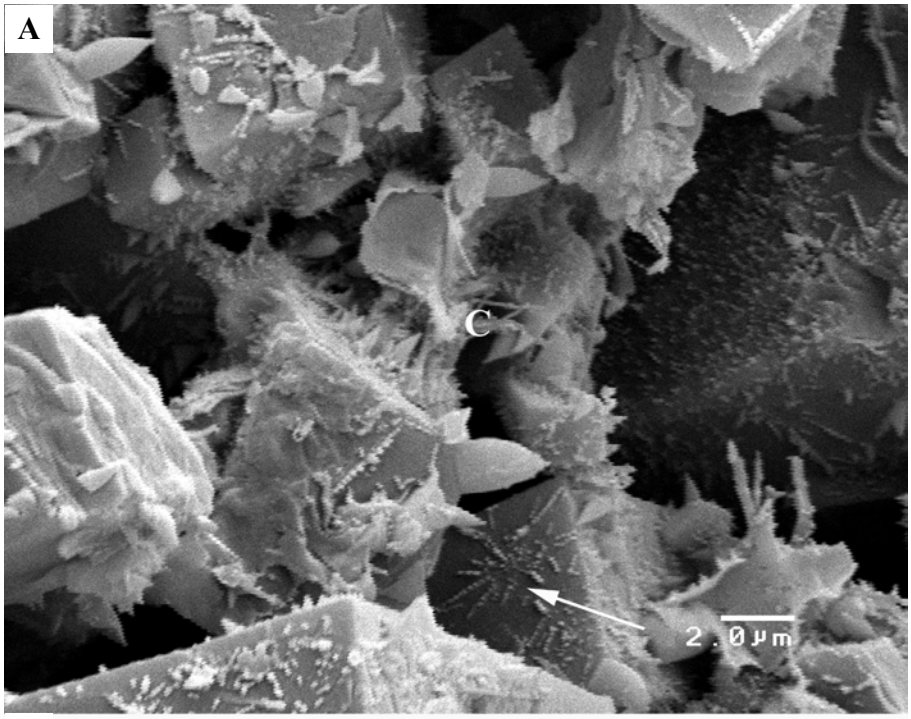
Photomicrograph 2B. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement showing the presence of fibrous illitic clays (arrow) extending into mesopores–BC. Black is porosity. Scale represents 10 microns (0.01 mm).



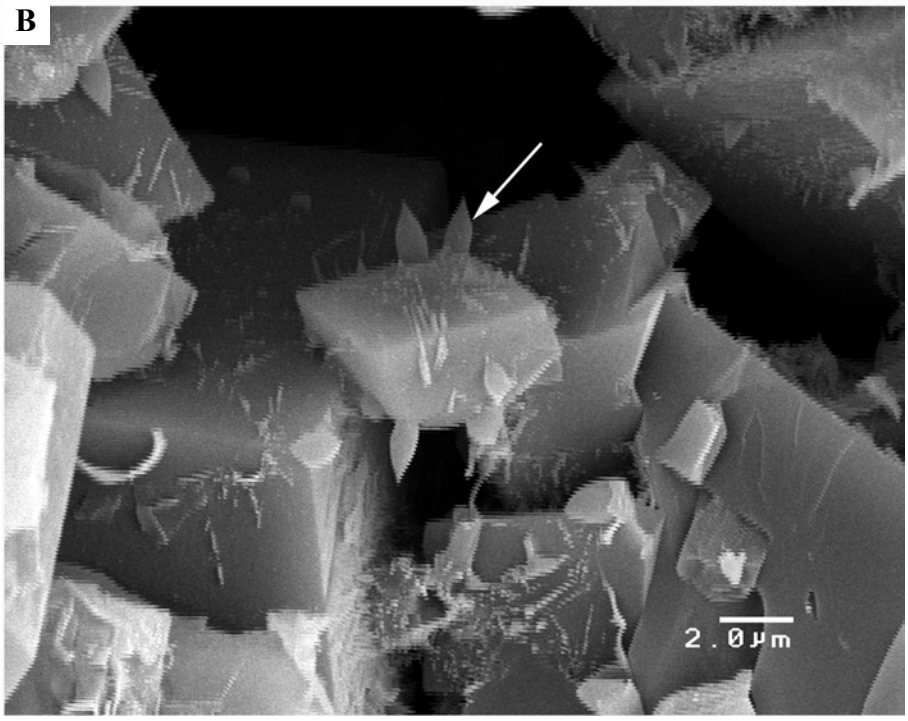
Photomicrograph 3A. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement of dolomite and intercrystalline porosity-BC. Liner features (arrow) on dolomite are either pyrobitumen or sulfides. Black is porosity. Scale represents 5 microns (0.005 mm).



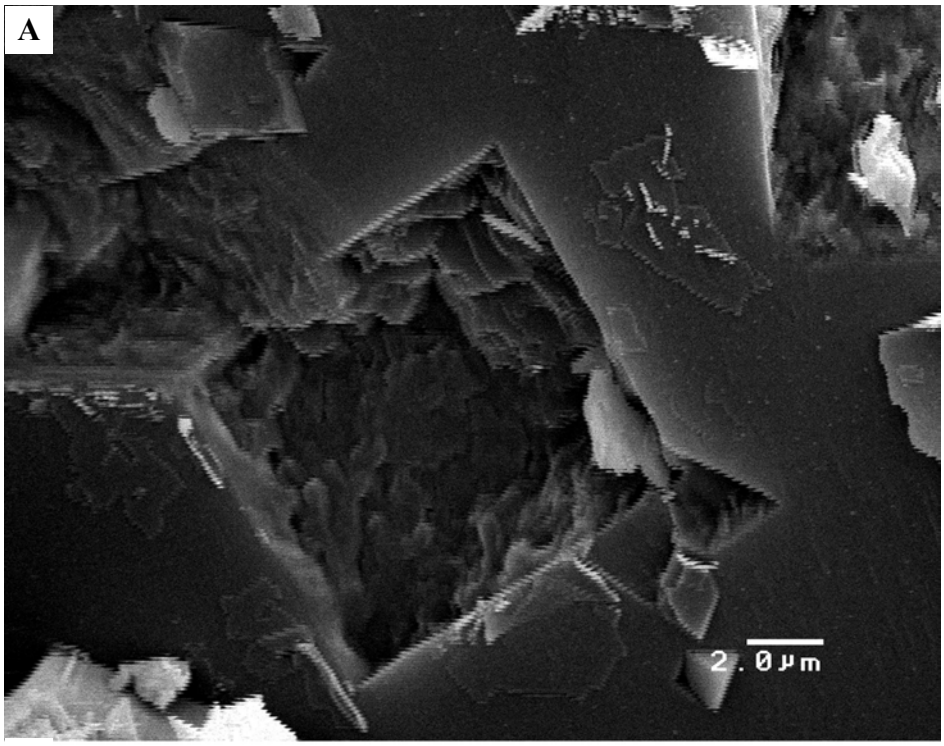
Photomicrograph 3B. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement of dolomite crystals partially covered with illitic clays (arrow). Liner features on crystals are either pyrobitumen or sulfides. Scale represents 2 microns (0.002 mm).



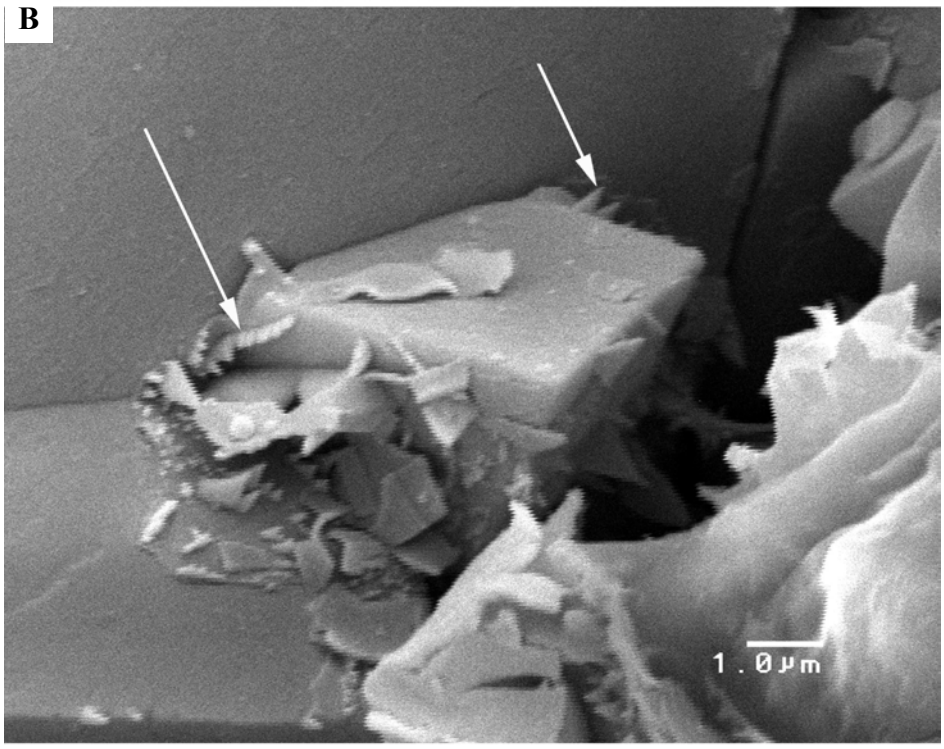
Photomicrograph 4A. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement showing fibrous illitic clays (C) and linear features (arrow) that are either pyrobitumen or sulfides. Black is porosity. Scale represents 2 microns (0.002 mm).



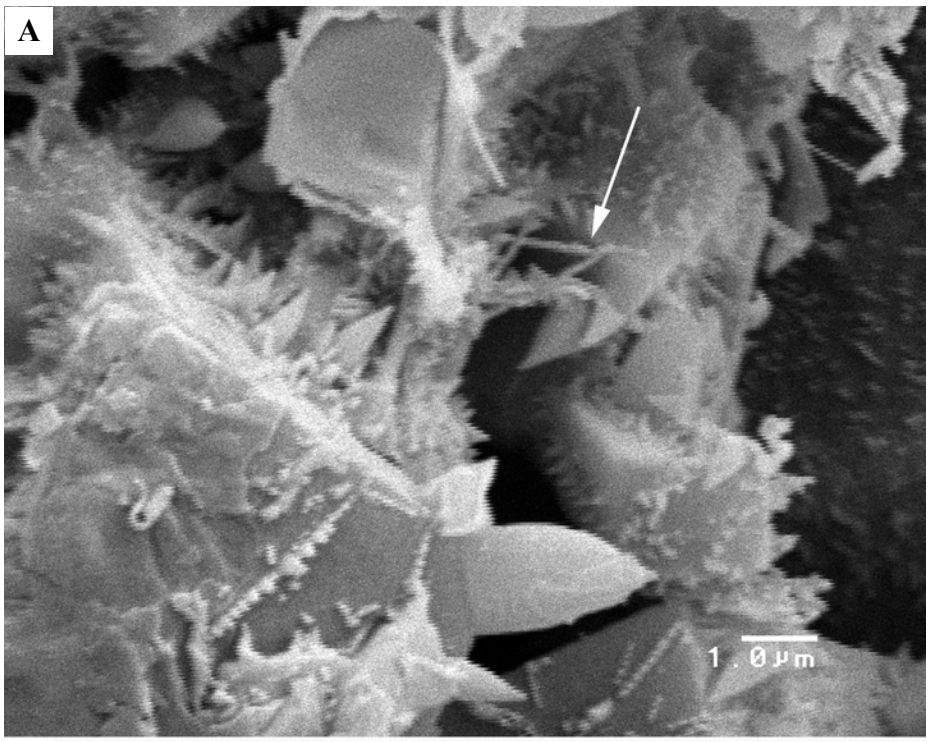
Photomicrograph 4B. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement showing possible sulfide precipitates (arrow). The liner features are also sulfides or pyrobitumen. Black is porosity. Scale represents 2 microns (0.002 mm).



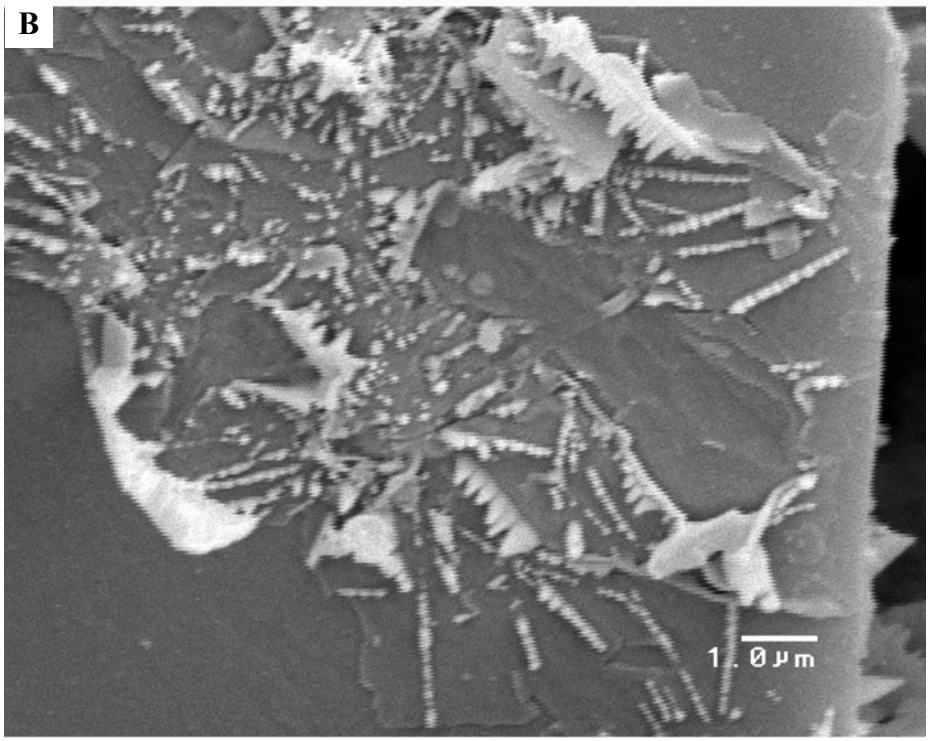
Photomicrograph 5A. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement showing an area from which a crystal was plucked (possibly during sample preparation) to reveal the cloudy interior of a zoned crystal. Scale represents 2 microns (0.002 mm).



Photomicrograph 5B. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement showing detail of possible sulfide precipitates (arrow) on dolomite crystals. Black is porosity. Scale represents 1 microns (0.001 mm).

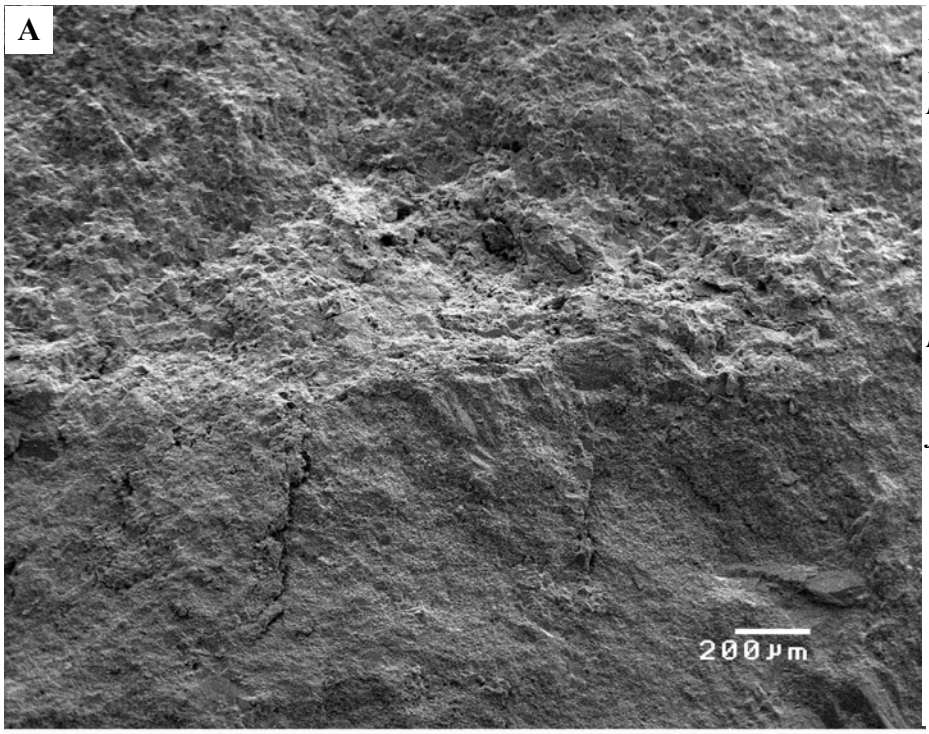


Photomicrograph 6A. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement showing details of fibrous illitic clays (arrow) and minute crystals that represent sulfides or pyrobitumen. Black is porosity. Scale represents 1 micron (0.001 mm).

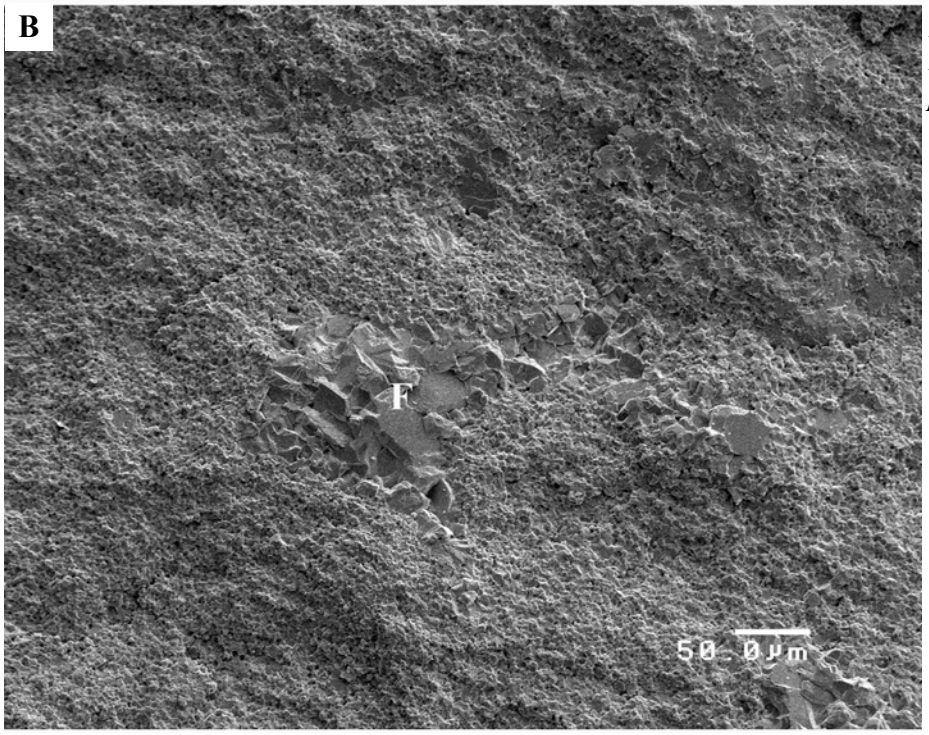


Photomicrograph 6B. Lisbon B-610. SEM photomicrograph of a core chip from 7897'. Enlargement showing linear features that are sulfide precipitates or pyrobitumen. Scale represents 1 micron (0.001 mm).

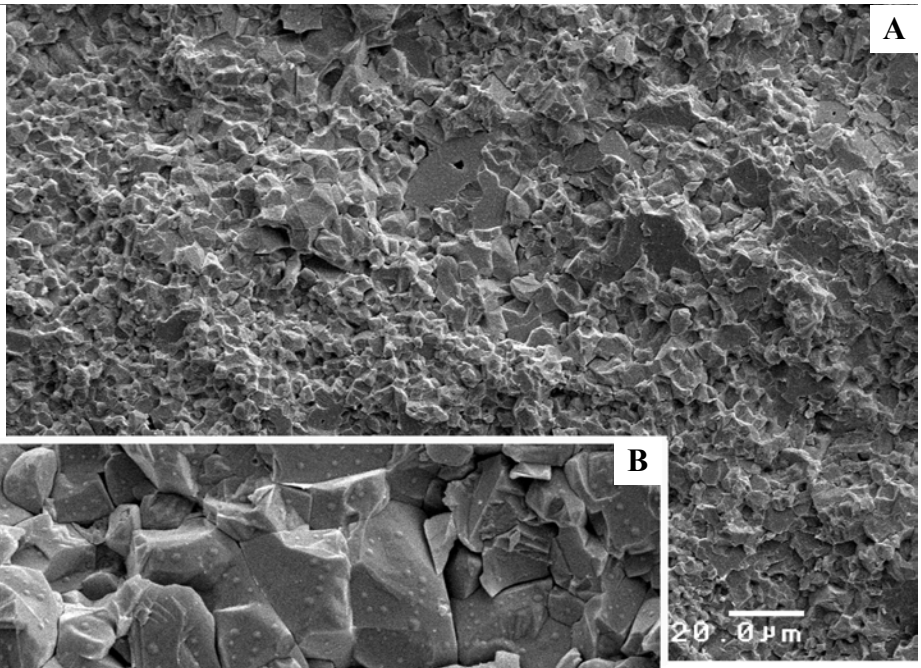
D-616 WELL,
LISBON FIELD



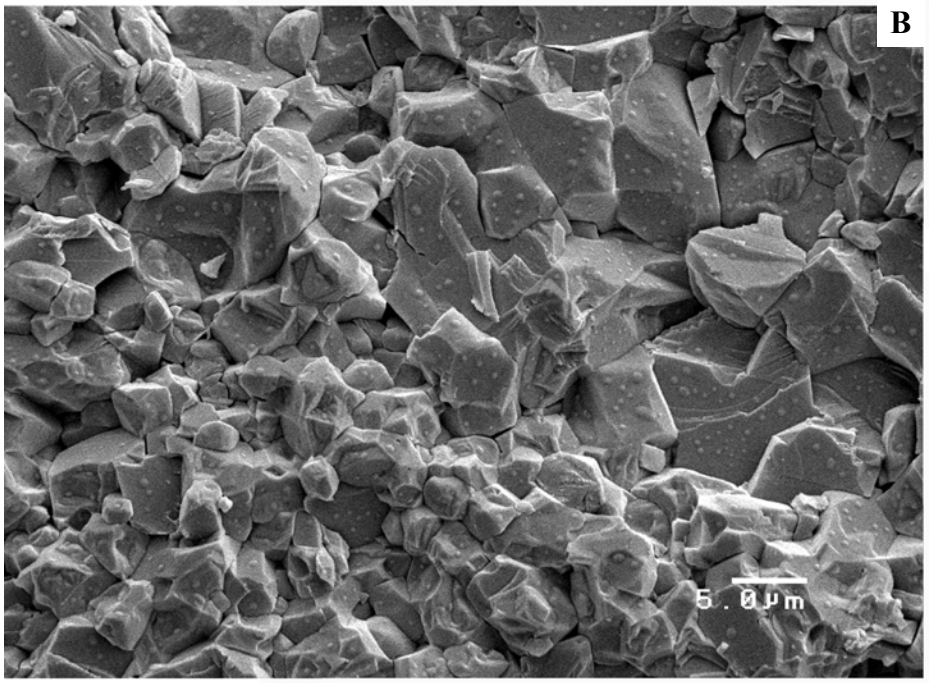
Photomicrograph 1A. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Overview showing contact of limestone matrix (above) with tight fill material. Note the porosity (black) visible in the matrix, but absent from the fill material. Scale represents 200 microns (0.2mm).



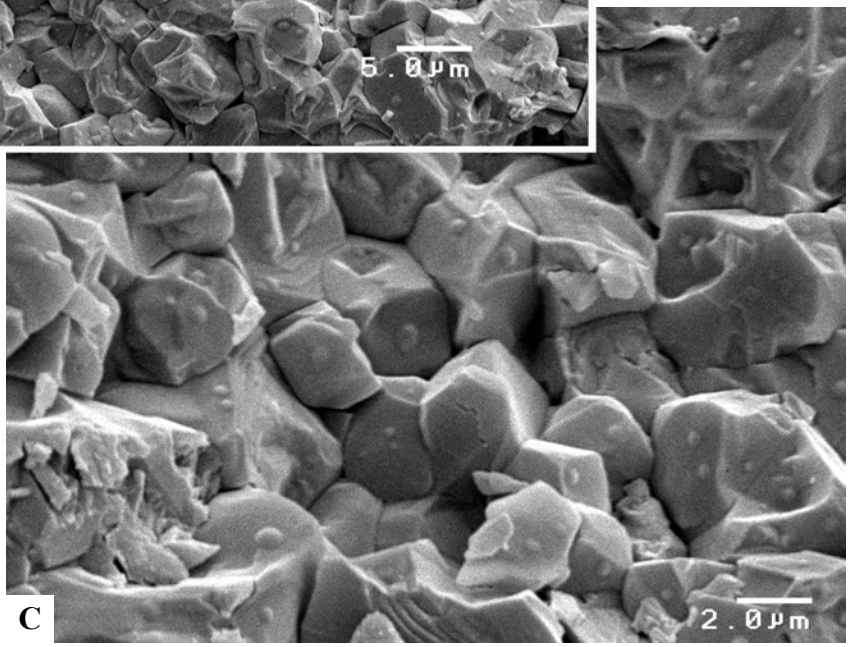
Photomicrograph 1B. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Possible fossil (F) present within the limestone matrix. Scale represents 50 microns (0.05 mm).



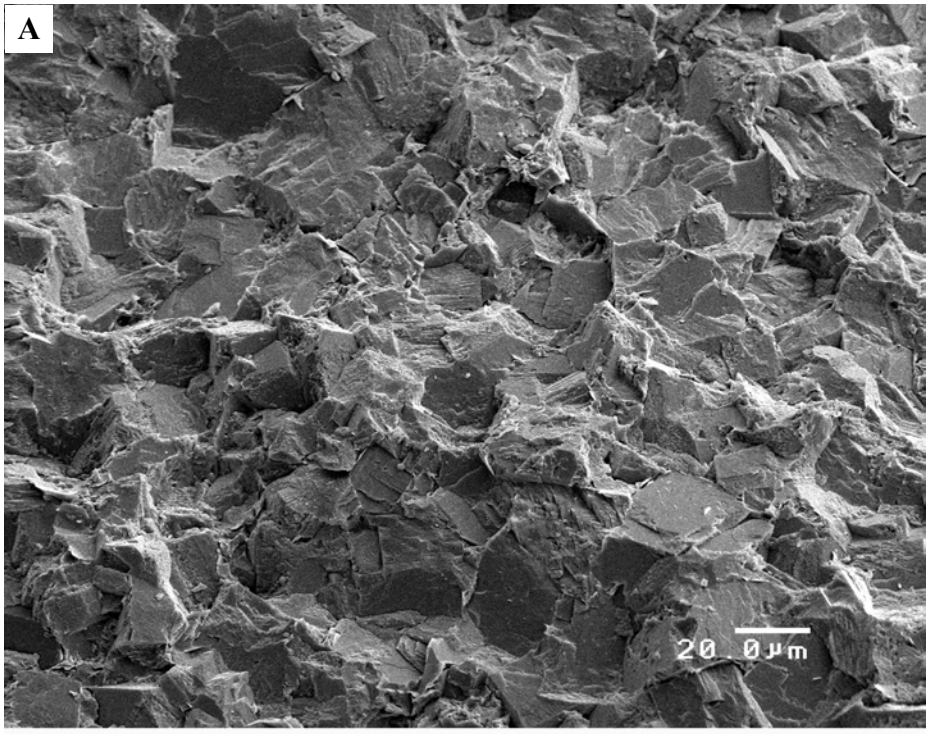
Photomicrograph 2A. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Calcite matrix exhibiting minor intercrystalline-BC microporosity (black). Scale represents 20 microns (0.02 mm).



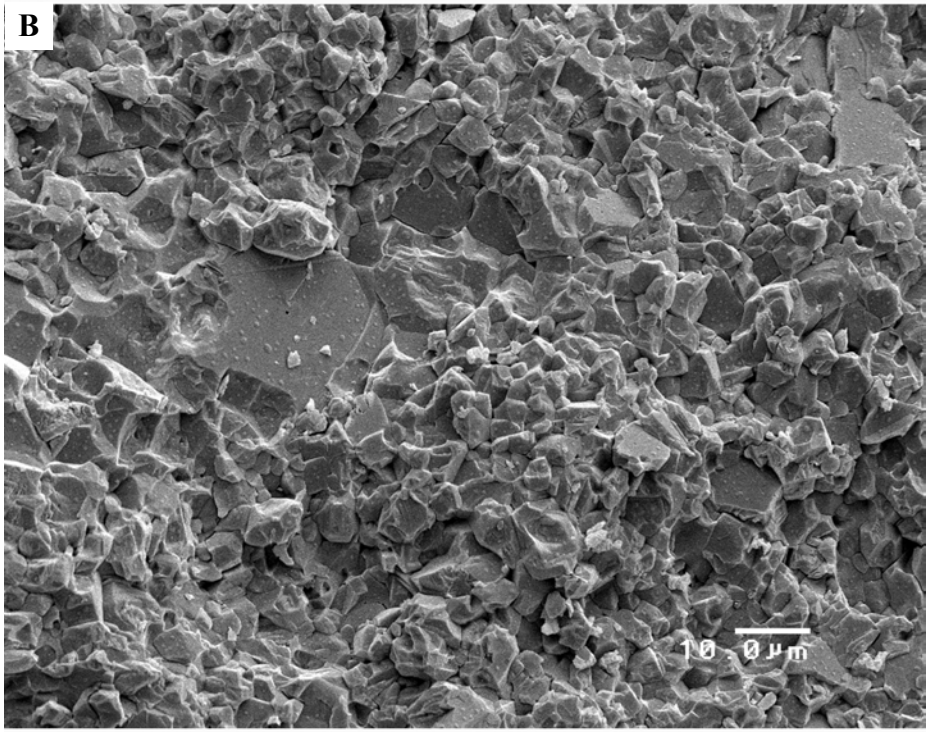
Photomicrograph 2B. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Enlargement of material from photomicrograph 2A showing general lack of significant porosity. Scale represents 5 microns (0.005 mm).



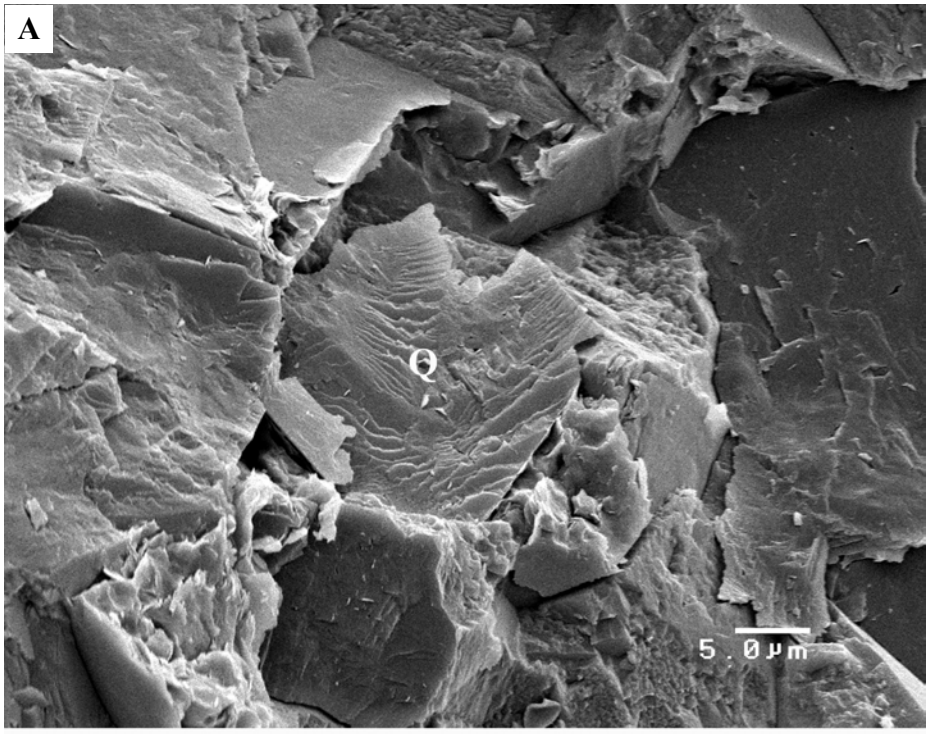
Photomicrograph 2C. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Enlargement of material from photomicrograph 2A showing general lack of significant porosity. Scale represents 2 microns (0.002 mm).



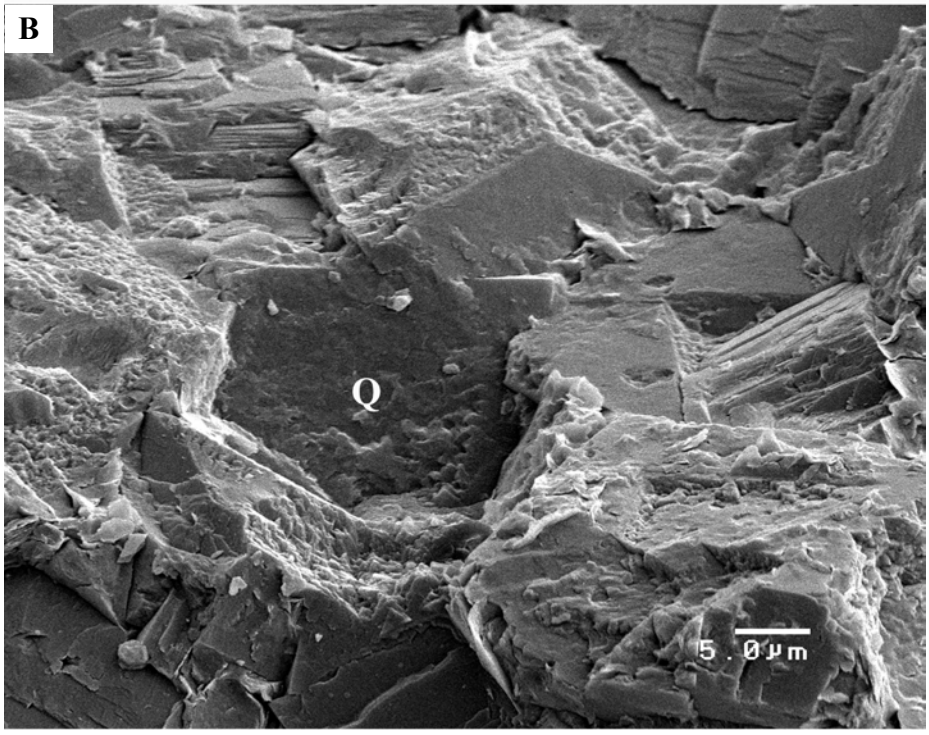
Photomicrograph 3A. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Enlargement showing detail of tight fill material consisting of dolomite and limestone. Scale represents 20 microns (0.02 mm).



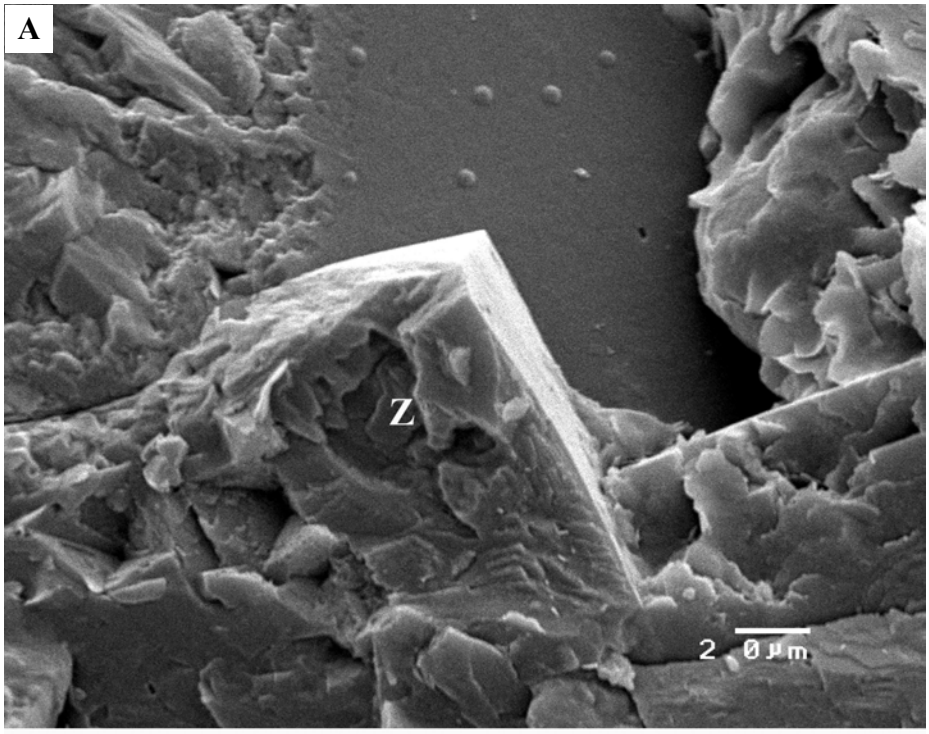
Photomicrograph 3B. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Enlargement showing detail of calcite matrix. Note the lack of significant porosity (black). Scale represents 10 microns (0.01 mm).



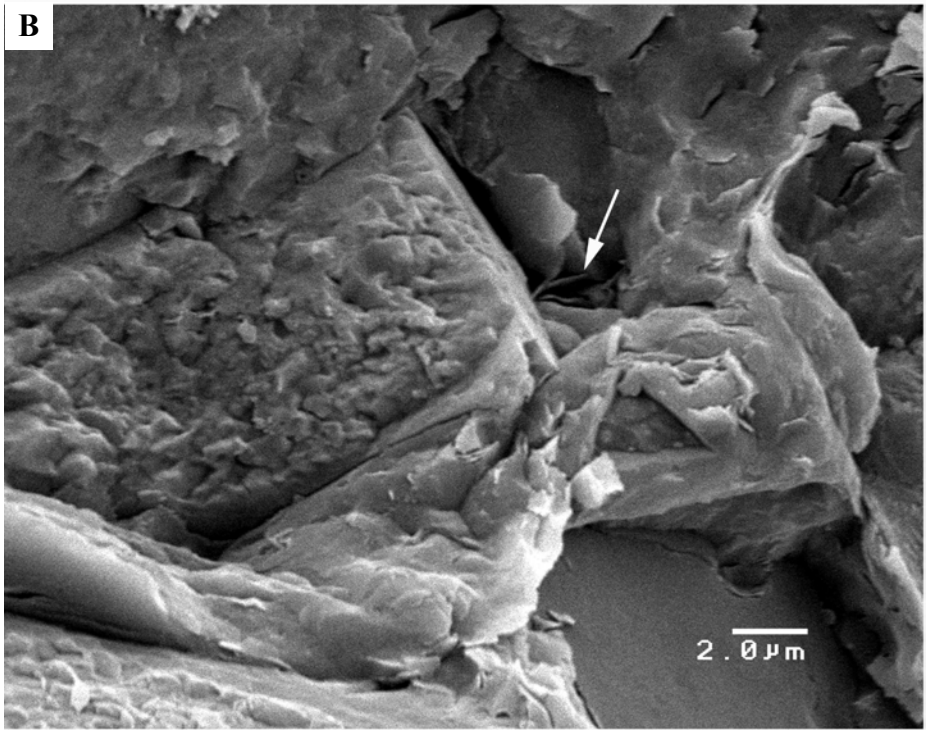
Photomicrograph 4A. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Enlargement of the fill material showing presence of quartz (Q), most likely a detrital grain. This grain exhibits fracture hackles that may be the result of fracturing during sample preparation. Scale represents 5 microns (0.005 mm).



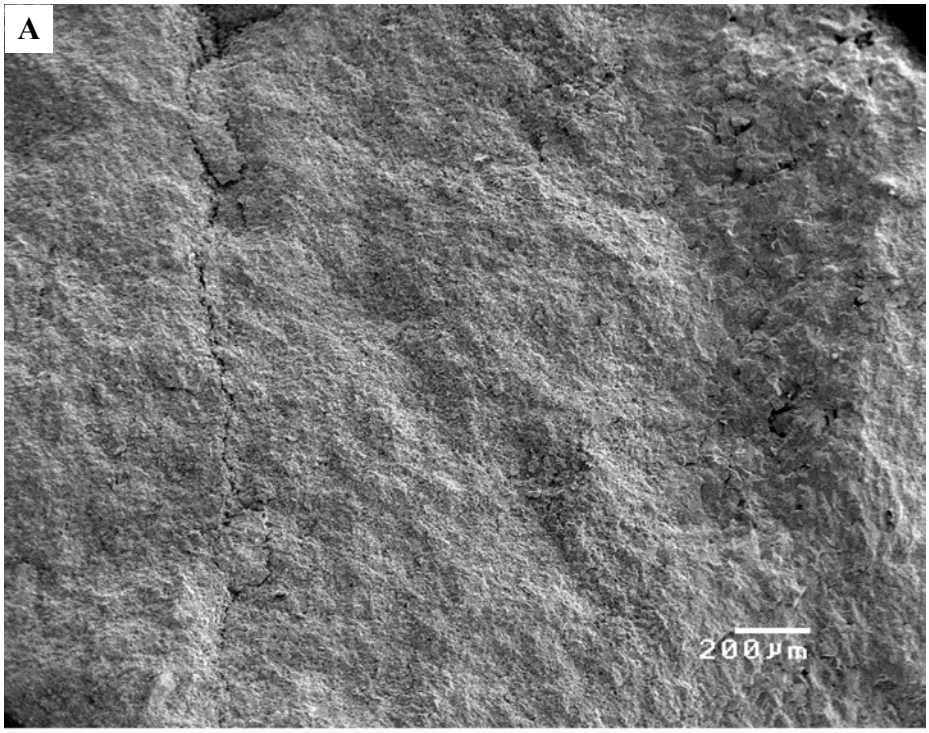
Photomicrograph 4B. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Enlargement of the fill material showing presence of quartz (Q), most likely a detrital grain. This grain exhibits fracture hackles that may be the result of fracturing during sample preparation. Scale represents 5 microns (0.005 mm).



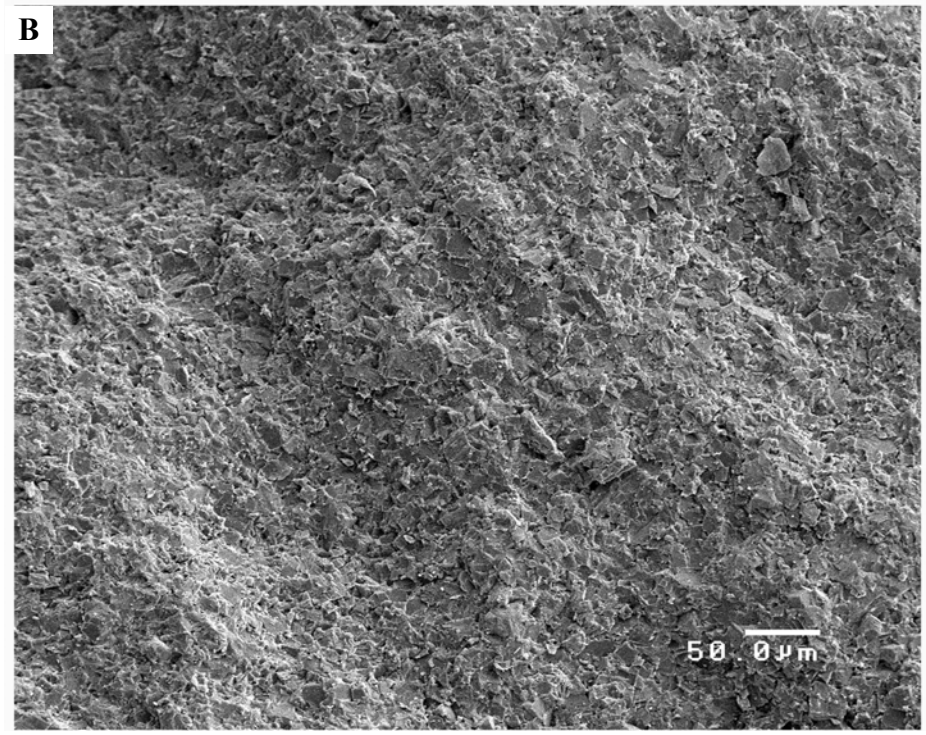
Photomicrograph 5A. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Enlargement showing detail of a zoned dolomite crystal (Z). The non-smooth material represents the cloudy center of this minute crystal. The spherical material on the crystal surface (upper center) are of unknown origin. They may be gold deposited during sample preparation. Scale represents 2 microns (0.002mm).



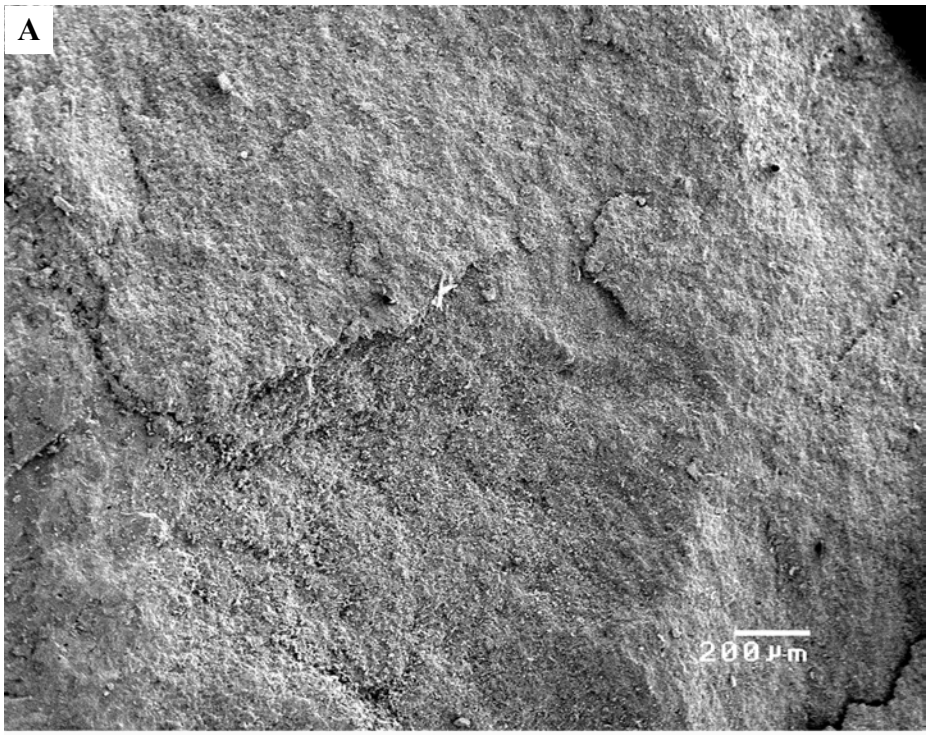
Photomicrograph 5B. Lisbon D-616. SEM photomicrograph of a core plug from 8308-09'. Enlargement showing possible minor clays (arrow) in intergranular-BC porosity. Scale represents 2 microns (0.002 mm).



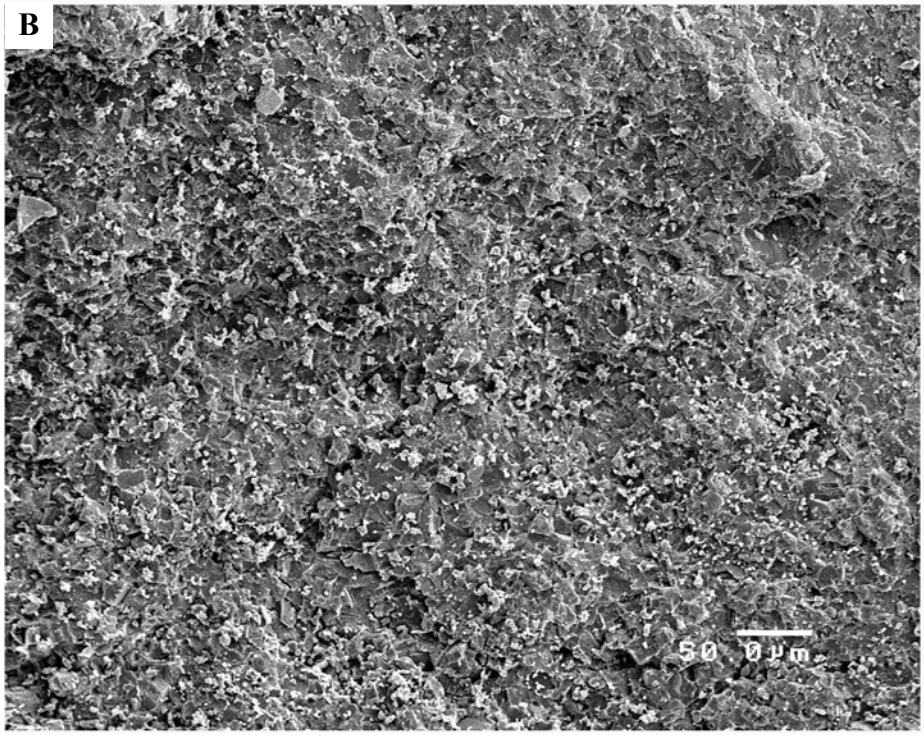
Photomicrograph 1A. Lisbon D-616. SEM photomicrograph of a core plug from 8356-57'. Overview of tight dolomitic limestone. Fracture on left is of questionable origin; probably not of natural origin. Black is porosity. Scale represents 200 microns (0.2 mm)



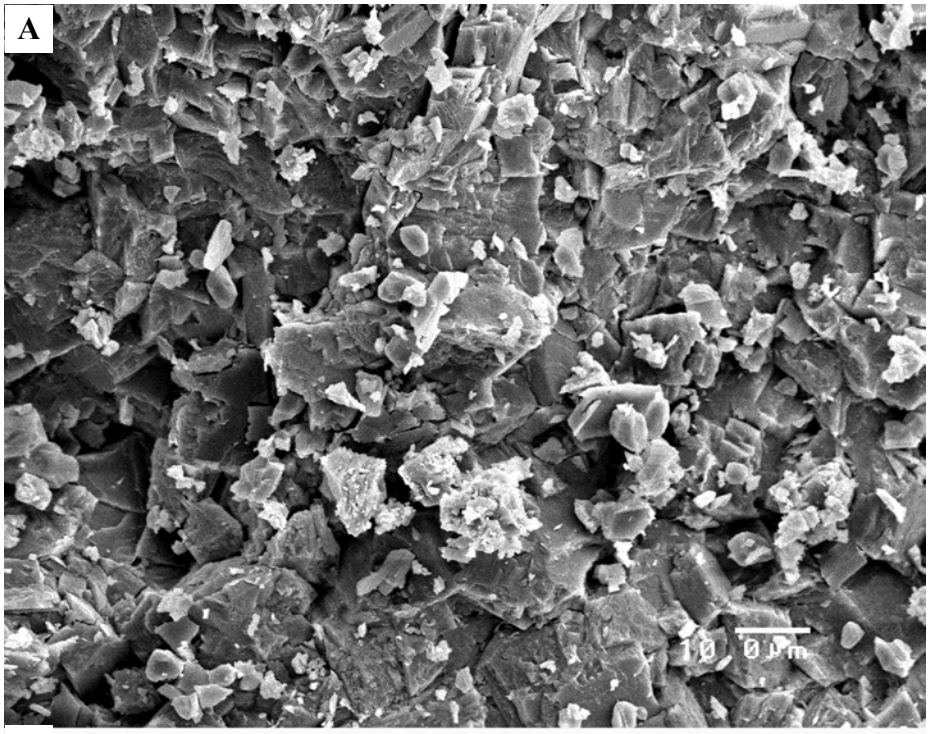
Photomicrograph 1B. Lisbon D-616. SEM photomicrograph of a core plug from 8356-57'. Slight enlargement of tight dolomitic limestone from photo-micrograph 1A. Note lack of significant pores (black). Scale represents 50 microns (0.05 mm)



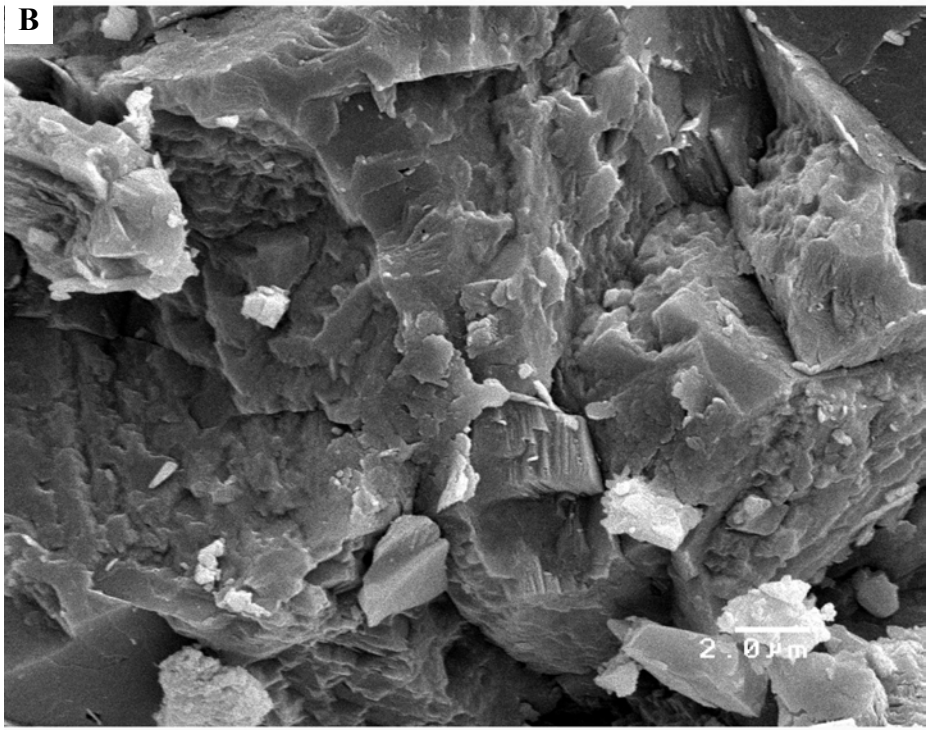
Photomicrograph 2A. Lisbon D-616. SEM photomicrograph of a core plug from 8356-57'. Overview of tight dolomitic limestone. Fractures appear to be artifacts of sample preparation. Scale represents 200 microns (0.2 mm)



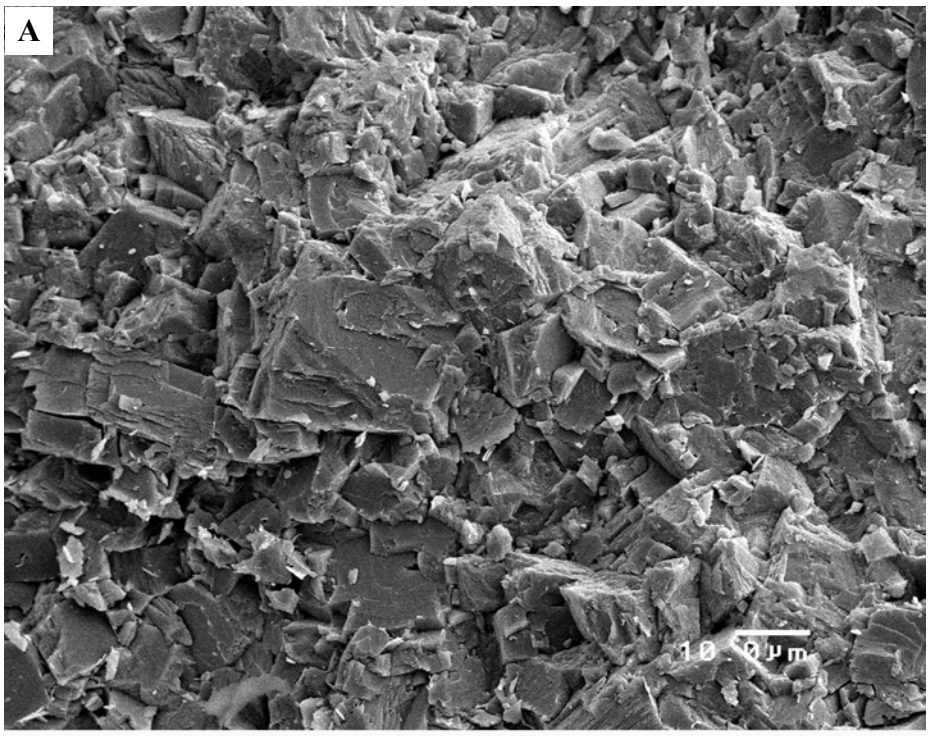
Photomicrograph 2B. Lisbon D-616. SEM photomicrograph of a core plug from 8356-57'. Slight enlargement of tight dolomitic limestone from photo-micrograph 2A. Note lack of significant pores (black). Scale represents 50 microns (0.05 mm).



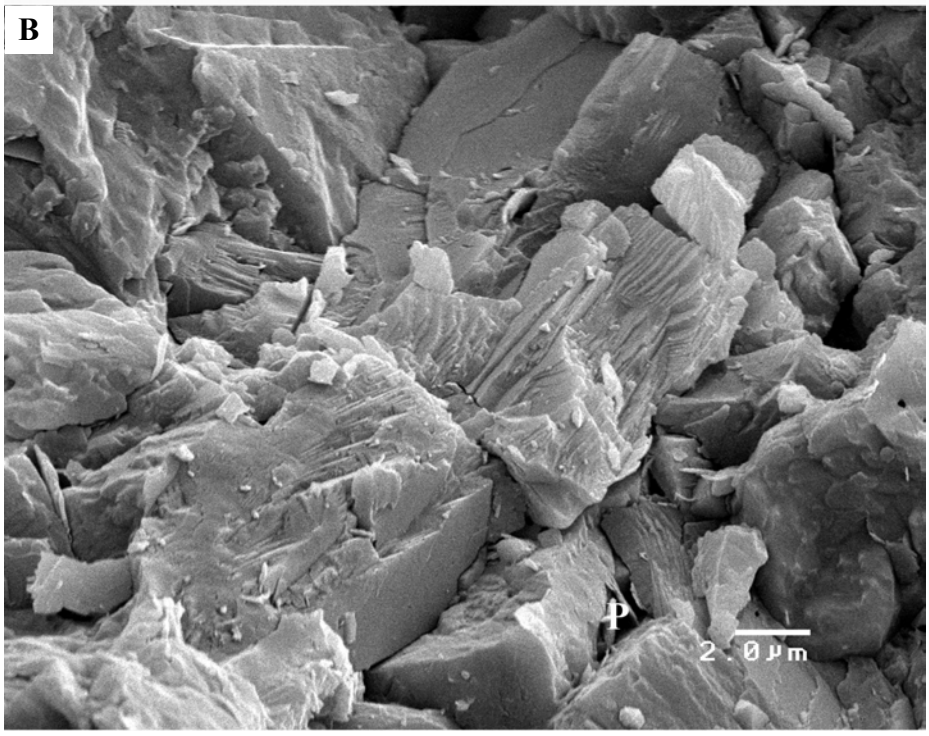
Photomicrograph 3A. Lisbon D-616. SEM photomicrograph of a core plug from 8356-57'. Enlargement of dolomitic limestone showing minor inter-crystalline-BC microporosity (black). Scale represents 10 microns (0.01 mm).



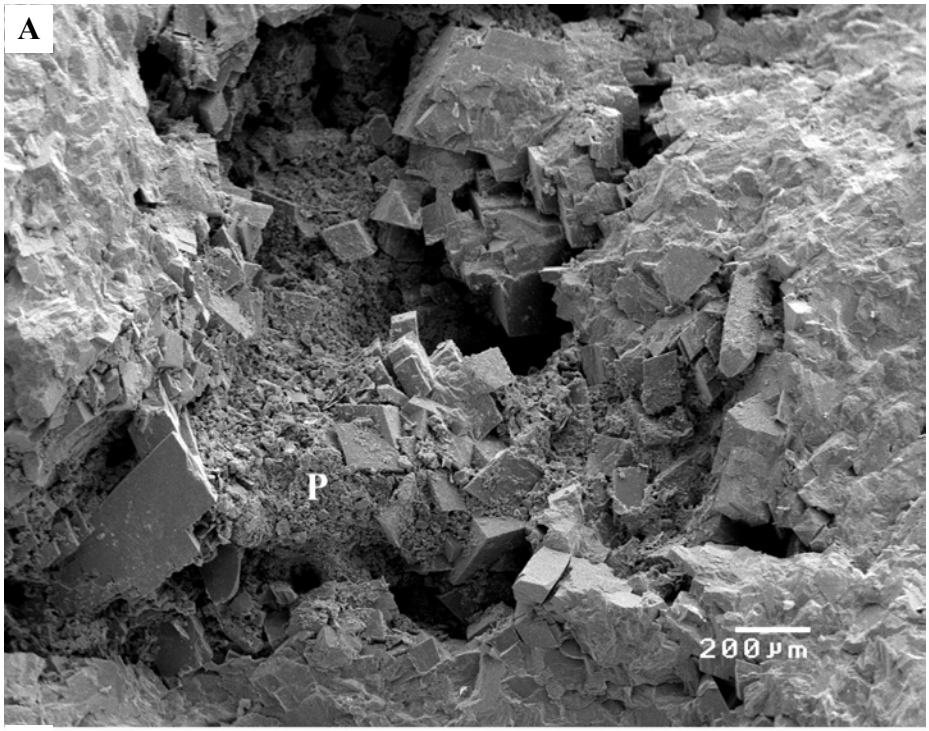
Photomicrograph 3B. Lisbon D-616. SEM photomicrograph of a core plug from 8356-57'. Enlargement of dolomitic limestone showing general lack of porosity. Scale represents 2 microns (0.002 mm).



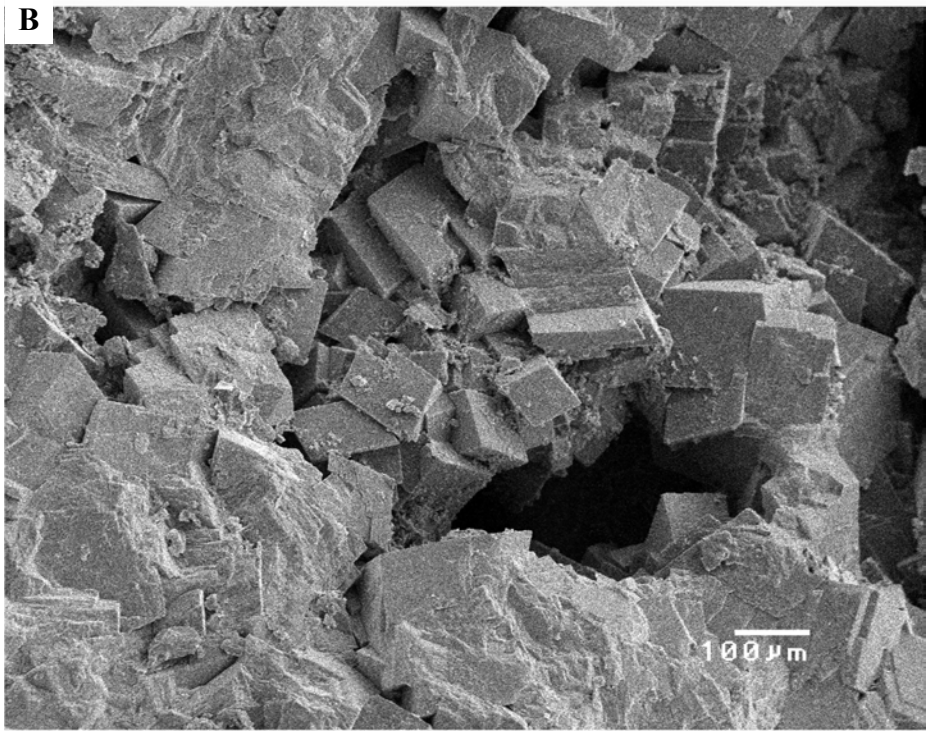
Photomicrograph 4A. Lisbon D-616. SEM photomicrograph of a core plug from 8356-57'. Enlargement of dolomitic limestone showing lack of porosity. Scale represents 10 microns (0.01 mm).



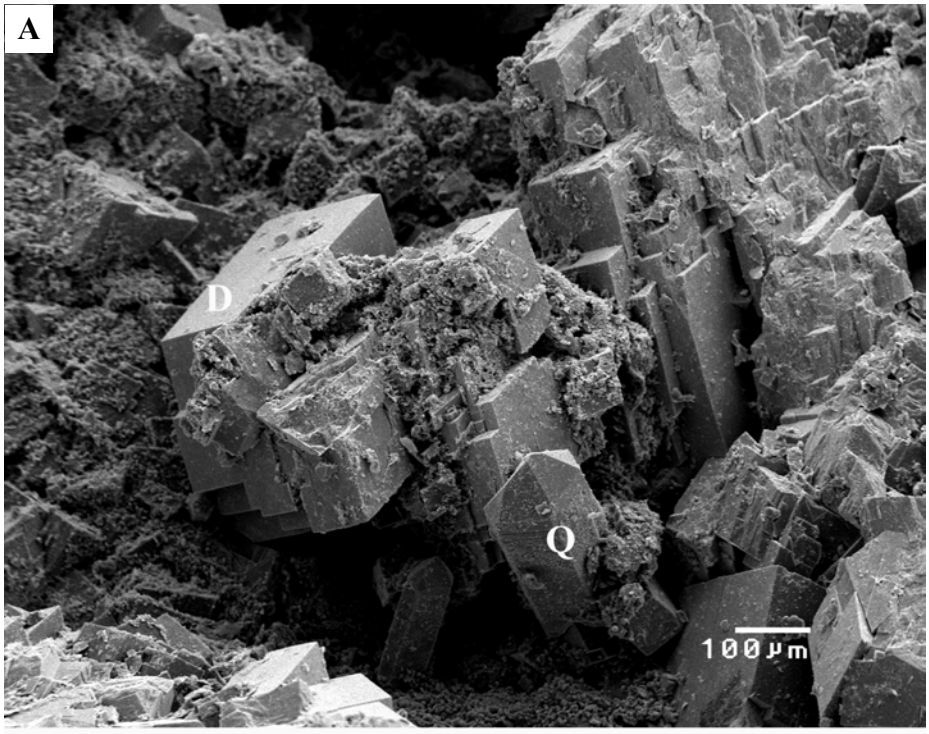
Photomicrograph 4B. Lisbon D-616. SEM photomicrograph of a core plug from 8356-57'. Enlargement of dolomitic limestone showing general lack of porosity among calcite crystals. Note the minute intercrystalline-BC pore in lower right center (P). Scale represents 2 microns (0.002 mm).



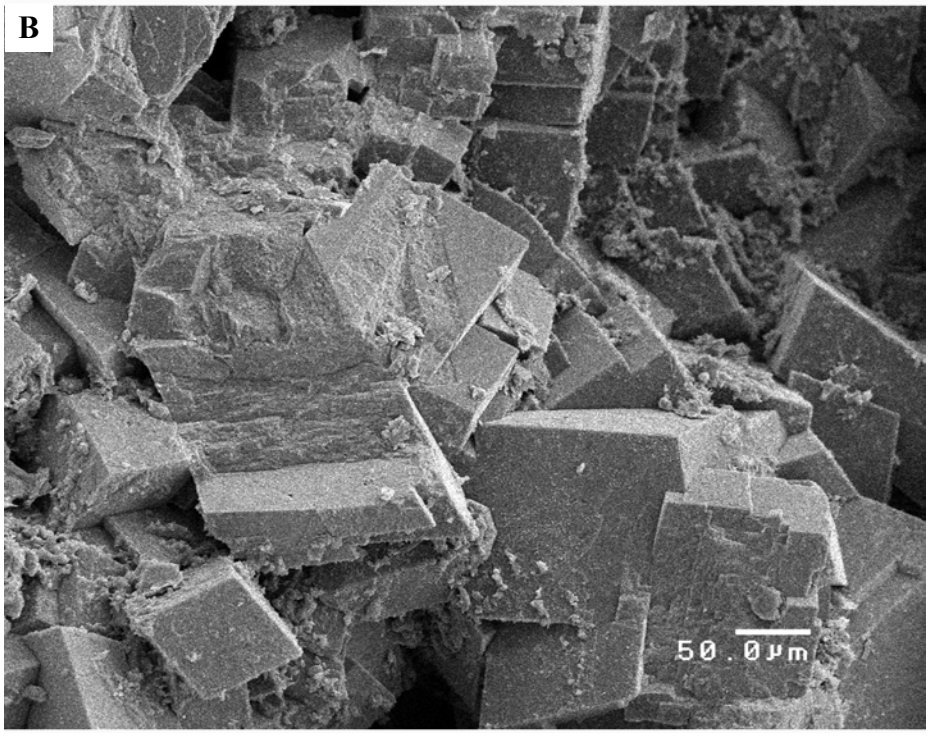
Photomicrograph 1A. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Dolomite exhibiting abundant mesomoldic –msMO or mesovuggy -msVUG porosity (black). Fine material among the larger dolomite crystals is pyrobitumen (P). Scale represents 200 microns (0.2 mm).



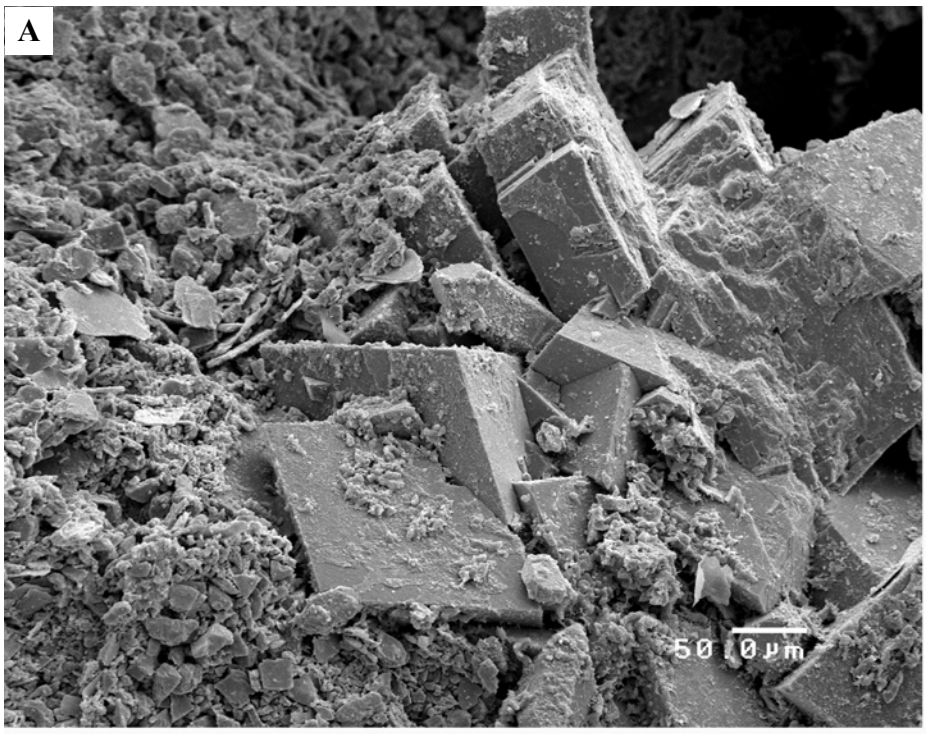
Photomicrograph 1B. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Dolomite crystals within a mesomold-msMO. Black is porosity. Scale represents 100 microns (0.1 mm).



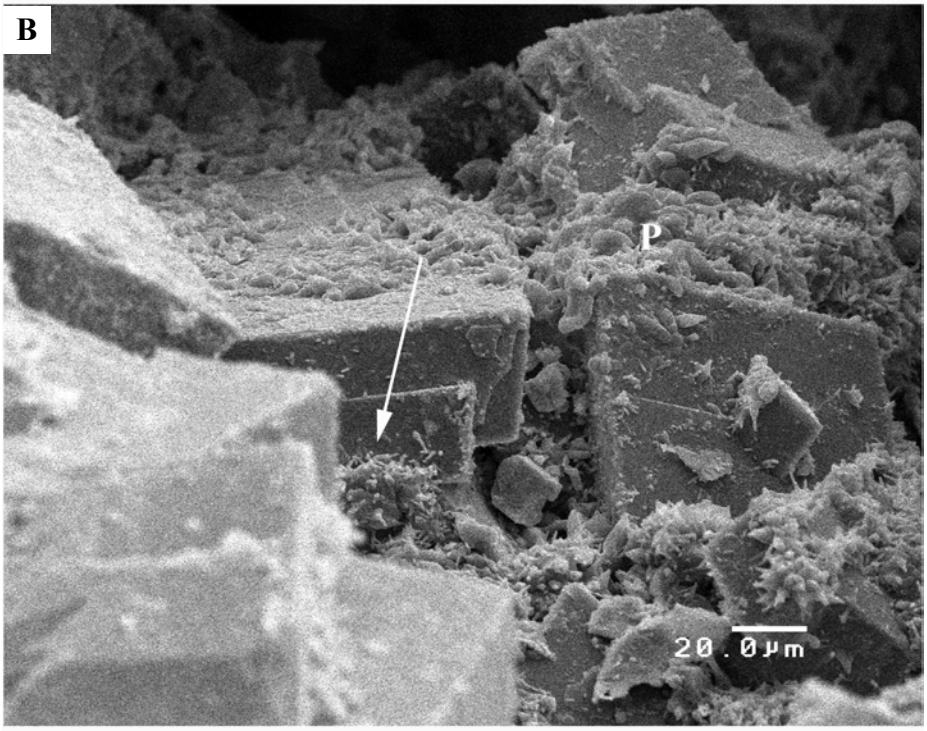
Photomicrograph 2A. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Dolomite (D) and quartz (Q) cements within a moldic-MO pore. Fine material within this moldic pore-MO is most likely pyrobitumen. Black is porosity. Scale represents 100 microns (0.1 mm).



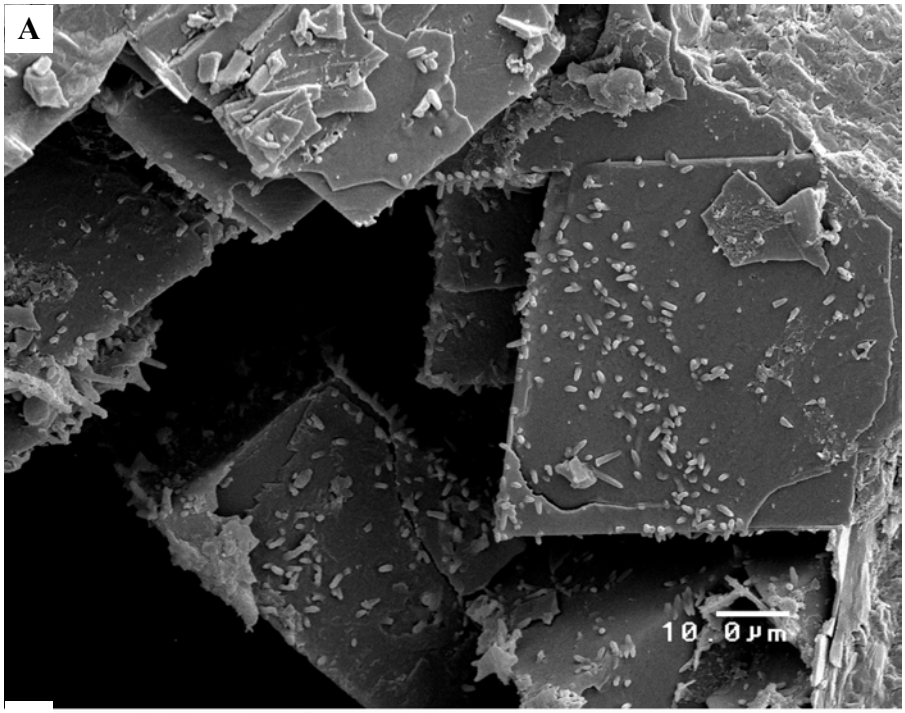
Photomicrograph 2B. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Enlargement showing intergrown dolomite crystals on the edge of moldic-MO porosity. Black is porosity. Scale represents 50 microns (0.05 mm).



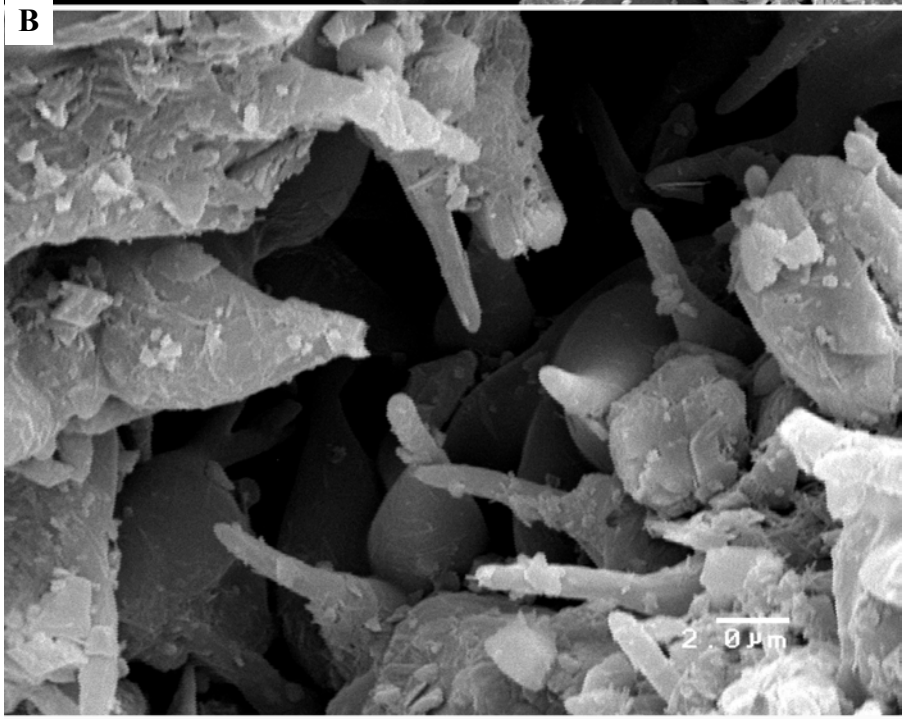
Photomicrograph 3A. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Enlargement showing dolomite with finer material, possibly a mixture of pyrobitumen and clays? Black is porosity. Scale represents 50 microns (0.05 mm).



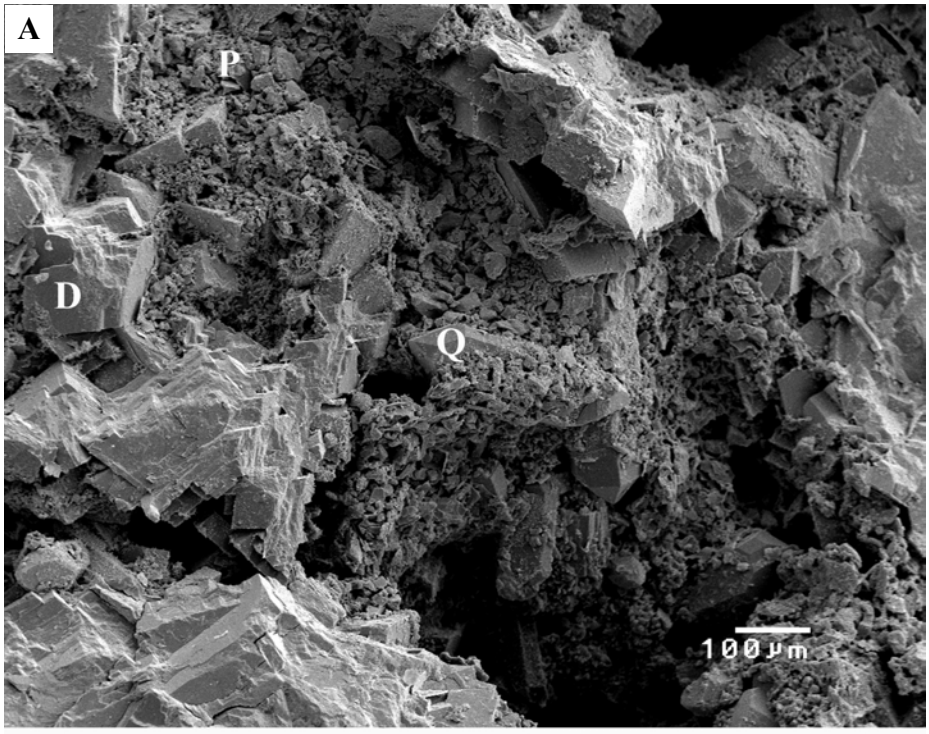
Photomicrograph 3B. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Enlargement showing dolomite crystals and the intercrystalline-BC porosity associated with them. The dolomite crystals are partially coated with possible illitic clays (arrow) and pyrobitumen (P). Scale represents 20 microns (0.02 mm).



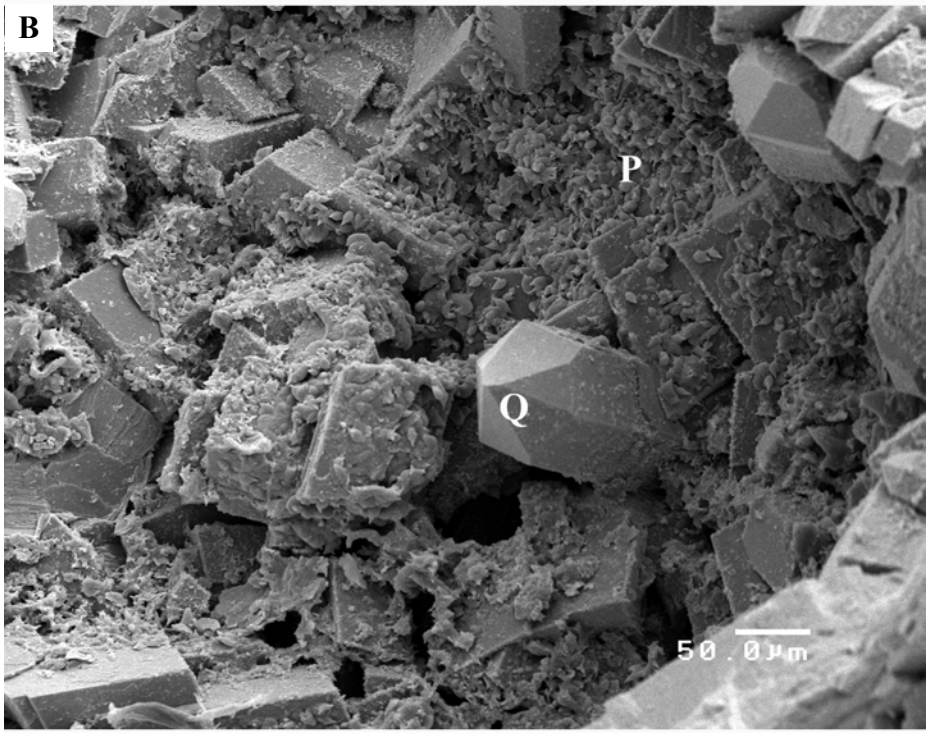
Photomicrograph 4A. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Enlargement showing dolomite crystals partially coated with material not positively identified. It may be pyrobitumen, sulfides, or even clay. It is not drilling mud. Scale represents 10 microns (0.01 mm).



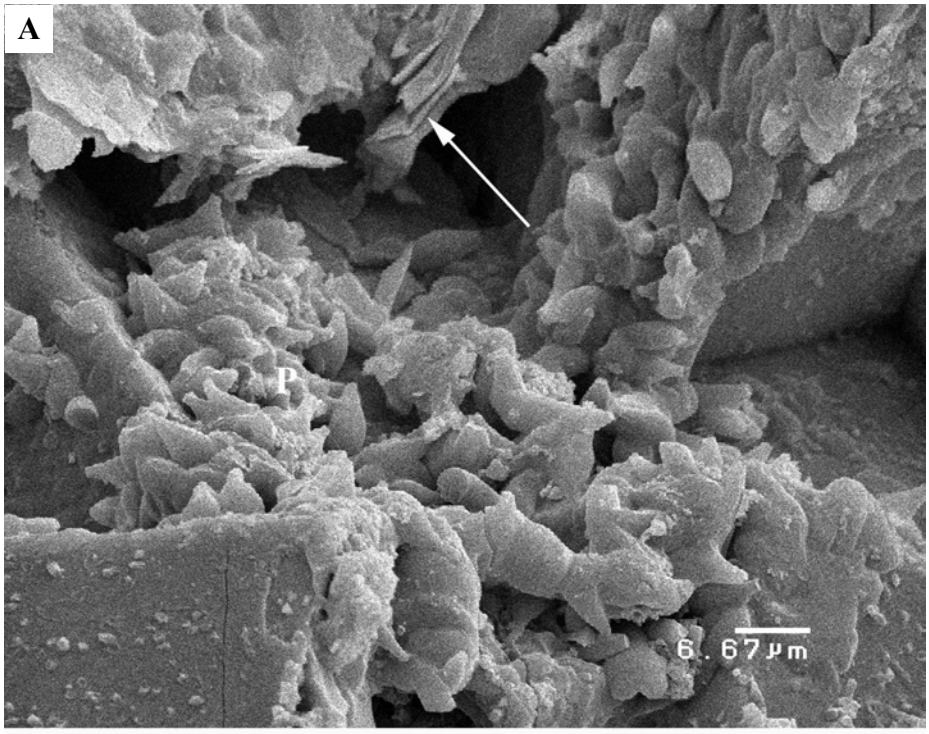
Photomicrograph 4B. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Enlargement showing detail of material coating dolomite in photomicrograph 4A. Its position within a pore and its extremely small size preclude accurate or precise elemental analysis with EDS. Morphologically this material appears to be amorphous and is most likely pyrobitumen. Scale represents 2 microns (0.002 mm).



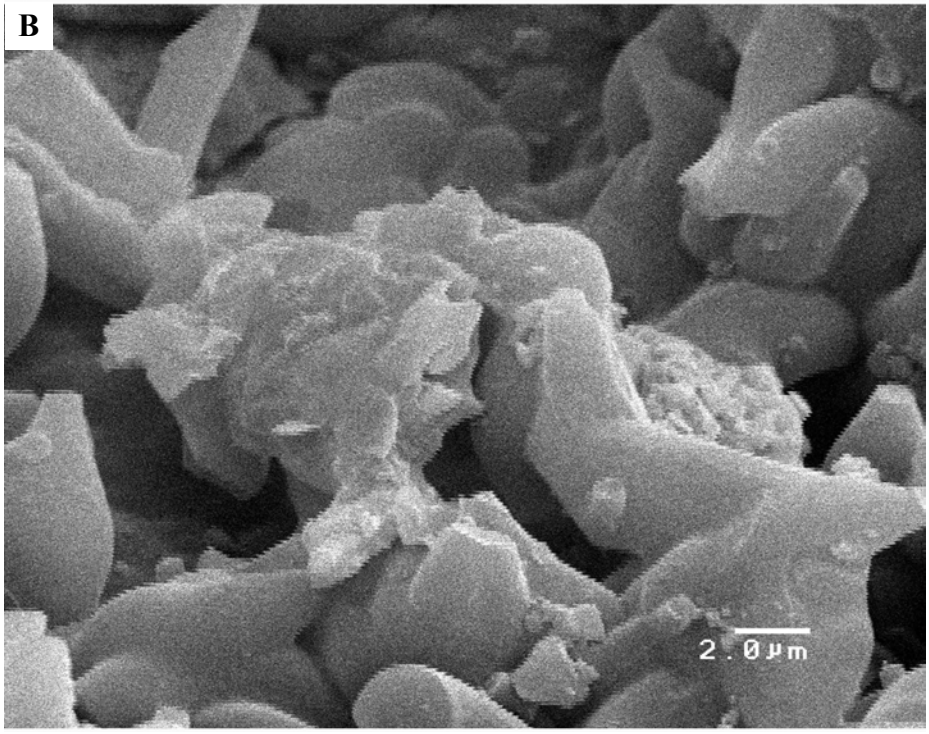
Photomicrograph 5A. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Slight enlargement of a mesomold-msMO showing dolomite (D) and quartz (Q) cement within it. The material partially coating the interior of the mold is pyrobitumen (P). Black is porosity. Scale represents 100 microns (0.1 mm).



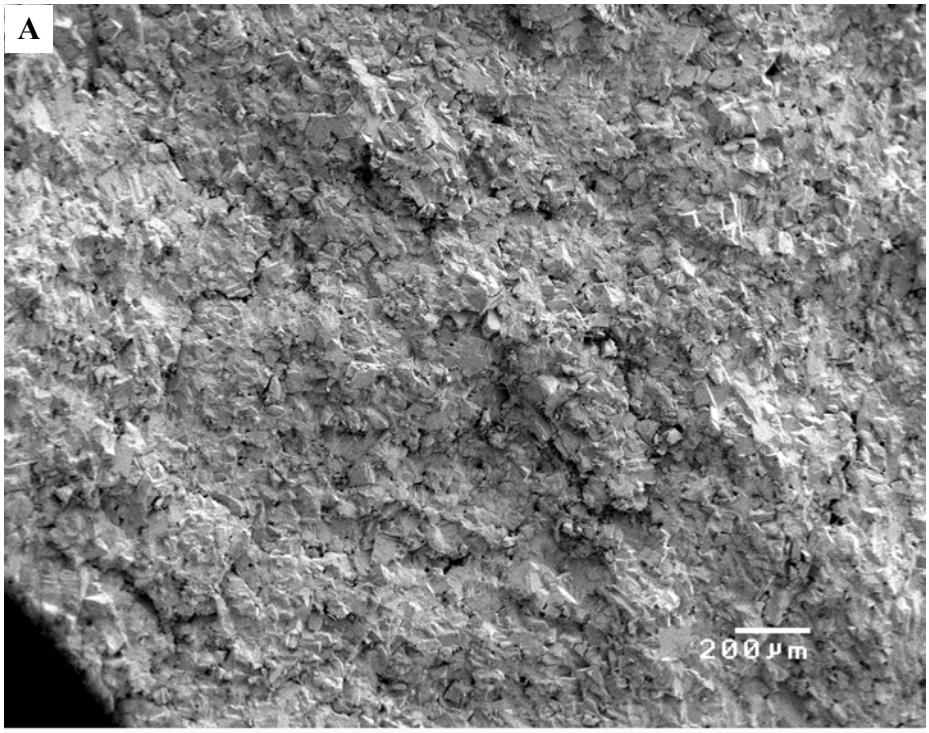
Photomicrograph 5B. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Enlargement showing detail of euhedral quartz cement (Q) and pyrobitumen (P) within mesomoldic-msMO porosity. Black is porosity. Scale represents 50 microns (0.05 mm).



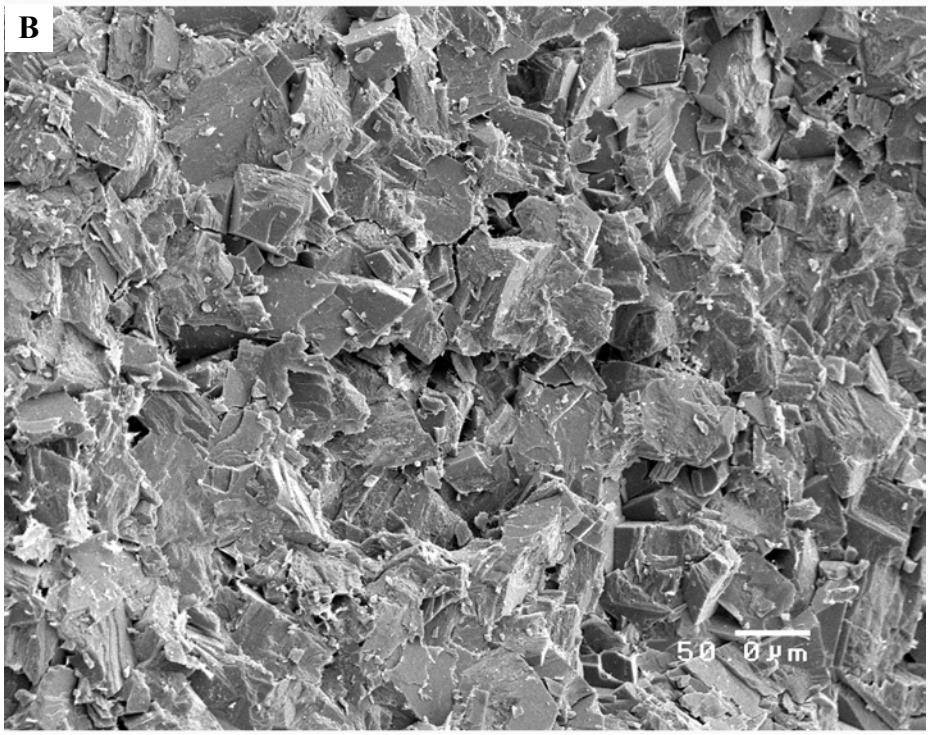
Photomicrograph 6A. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Enlargement showing detail of intercrystalline-BC porosity partially filled with pyrobitumen (P) and, possibly, clays (arrow). Black is porosity. Scale represents 6.67 microns (0.007 mm).



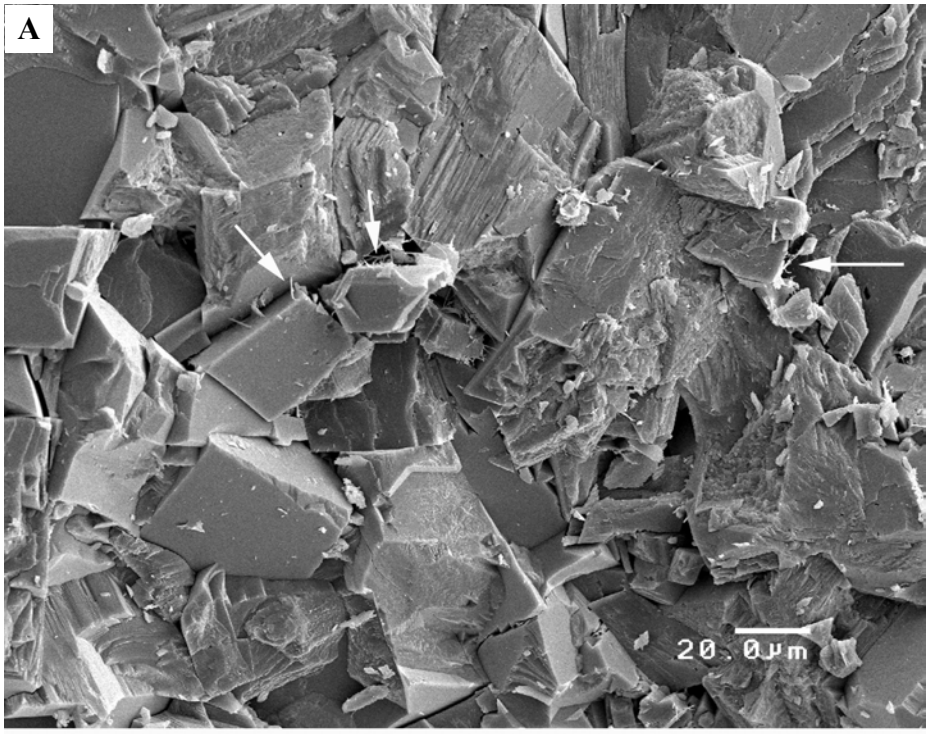
Photomicrograph 6B. Lisbon D-616. SEM photomicrograph of a core plug from 8619'. Enlargement showing detail of pyrobitumen from photomicrograph 6A. Note the presence of microporosity in the form of intercrystalline-BC pores. Scale represents 2 microns (0.002 mm)



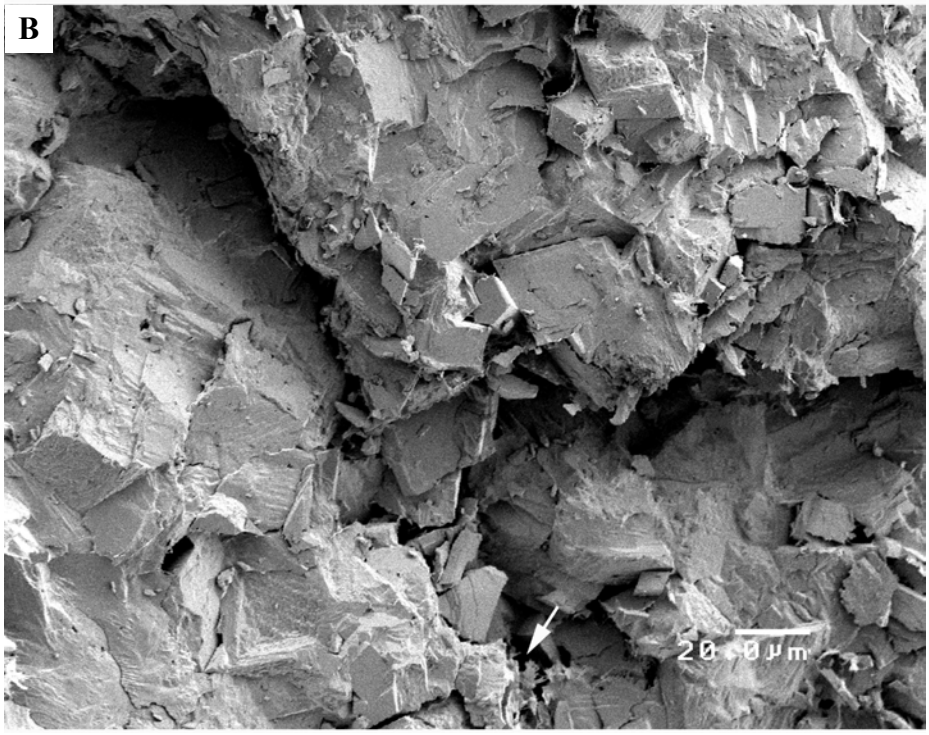
Photomicrograph 1A. Lisbon D-616. SEM photomicrograph of a core chip from 8682'. Overview of relatively tight dolomite with minor microinter-crystalline-mcBC and fracture-FR porosity. Scale represents 200 microns (0.2 mm).



Photomicrograph 1B. Lisbon D-616. SEM photomicrograph of a core chip from 8682'. Slight enlargement of tight dolomite. Note the paucity of pores (black). Scale represents 50 microns (0.05 mm).

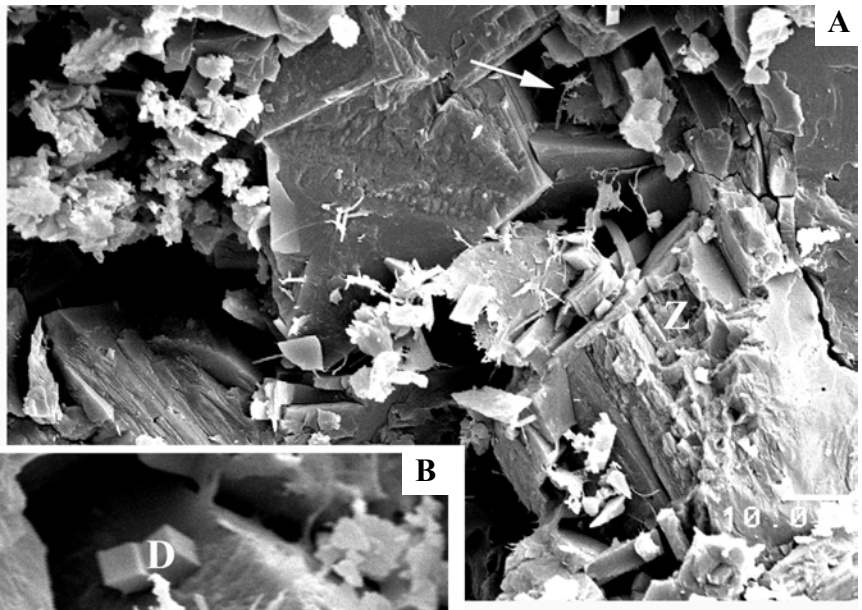


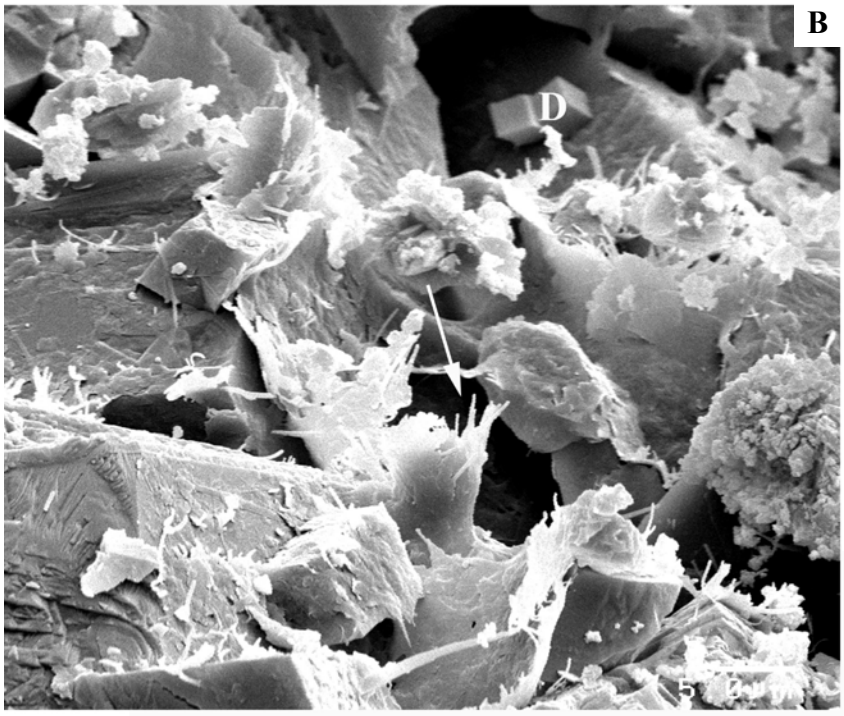
Photomicrograph 2A. Lisbon D-616. SEM photomicrograph of a core chip from 8682'. Enlargement showing relatively tight dolomite. Black is micro-intercrystalline -mcBC porosity. Note the present of minor clays (arrows) extending across pores. Scale represents 20 microns (0.02 mm).



Photomicrograph 2B. Lisbon D-616. SEM photomicrograph of a core chip from 8682'. Enlargement showing fracture-FR porosity with illitic clays (arrow) extending into it. Black is porosity. Scale represents 20 microns (0.02 mm).

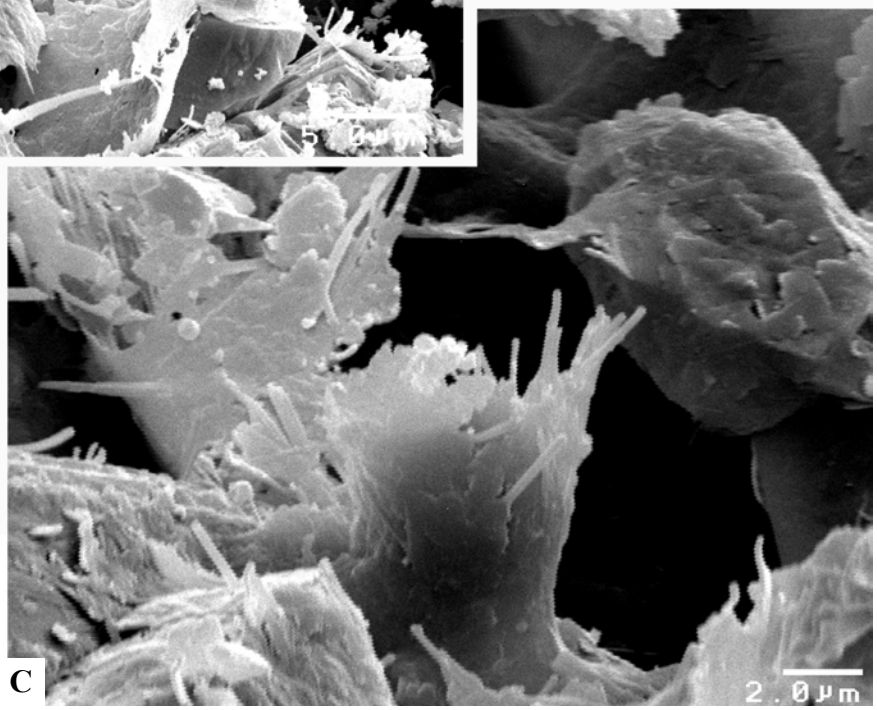
Photomicrograph 3A. Lisbon D-616. SEM photomicrograph of a core chip from 8682'. Enlargement showing details of dolomite, possibly zoned dolomite (Z) within a fracture. Illitic clays are visible, with fibers (arrow) extending into porosity (black). Scale represents 10 microns (0.01 mm).



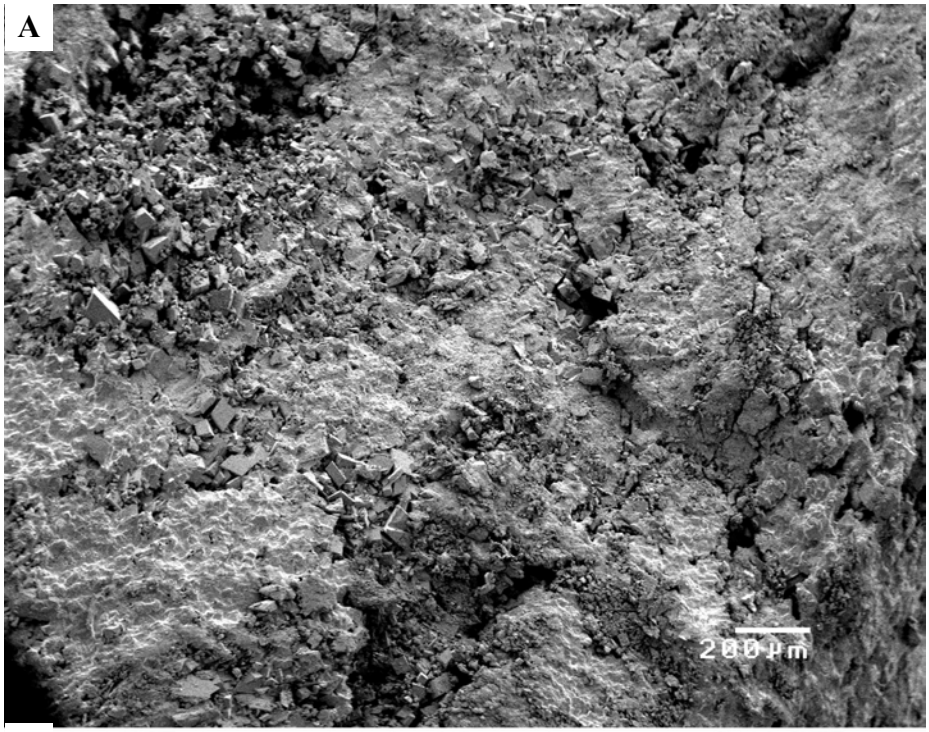


Photomicrograph 3B. Lisbon D-616. SEM photomicrograph of a core chip from 8682'. Enlargement of the pore system from photomicrograph 3A showing details of Illite clay fibers (arrow) extending into porosity (black). Minute dolomite crystals (D) visible within the porosity. Scale represents 5 microns (0.005 mm).

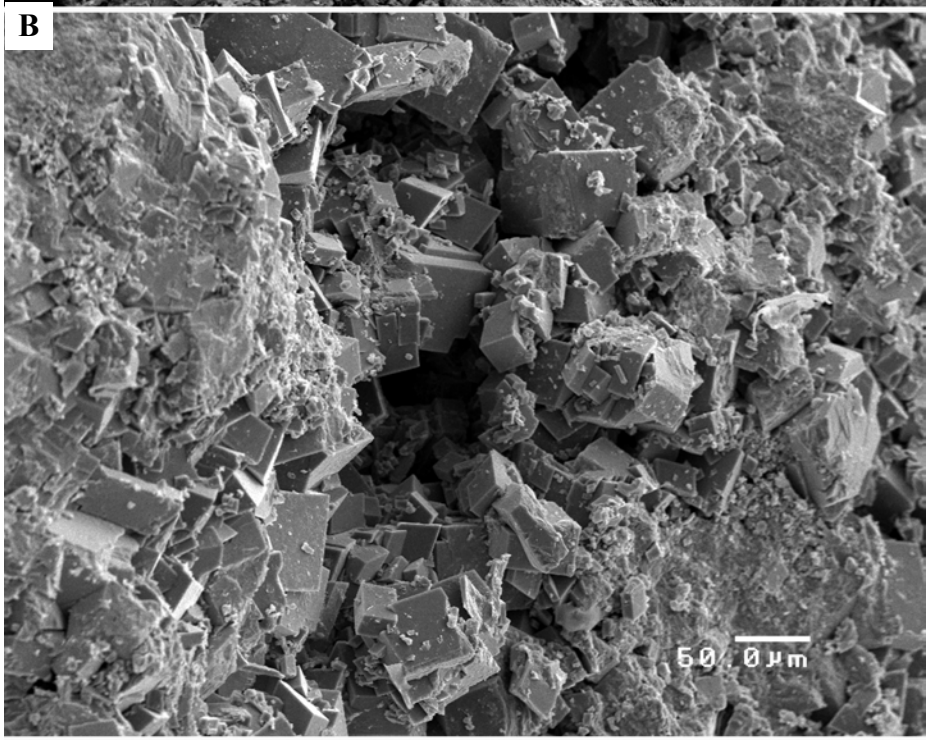
Photomicrograph 3C. Lisbon D-616. SEM photomicrograph of a core chip from 8682'. Enlargement showing details of illitic clay fibers from photomicrograph 3B. Scale represents 2 microns (0.002 mm).



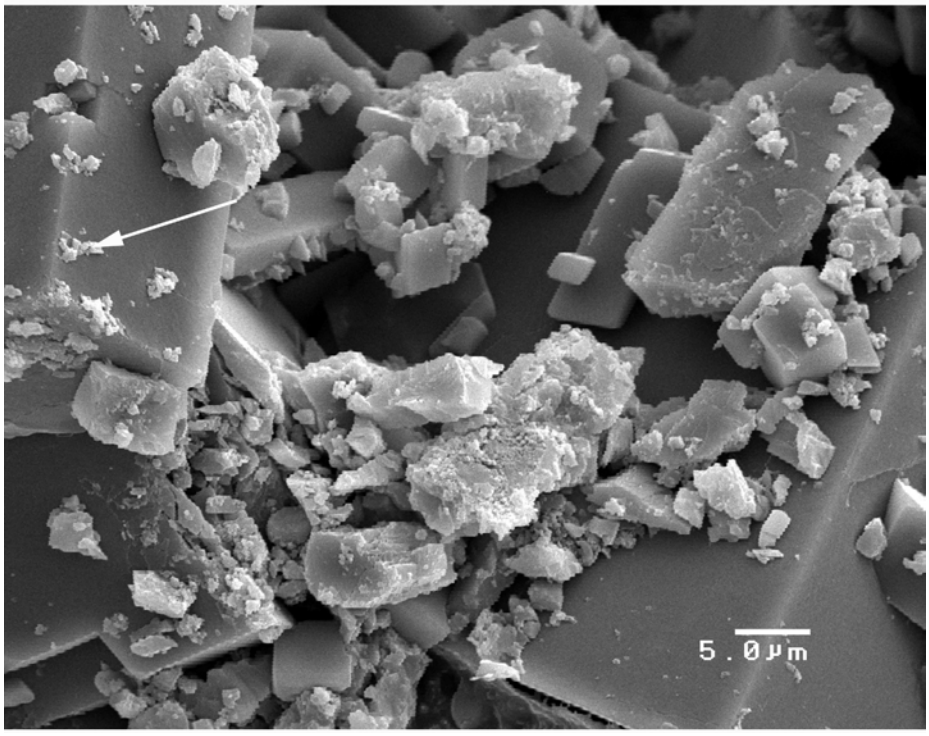
D-816 WELL,
LISBON FIELD



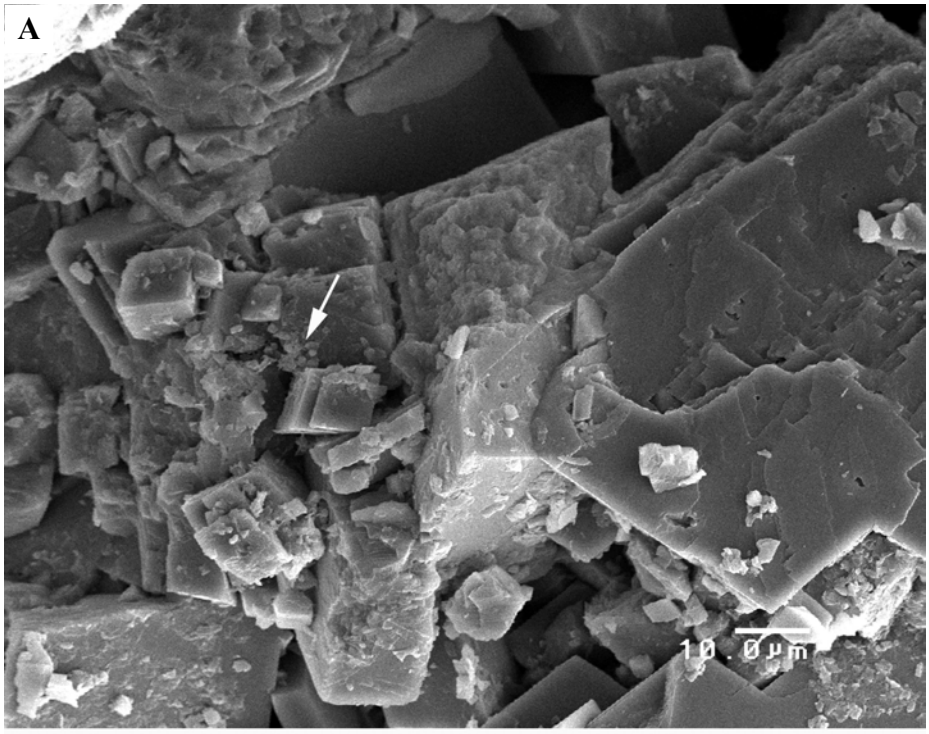
Photomicrograph 1A. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Overview of dolomite exhibiting vuggy porosity (black). Note the coated area in the lower left. This crystal appears to be coated with salt (NaCl) that is most likely an artifact of drilling. Scale represents 200 microns (0.2 mm).



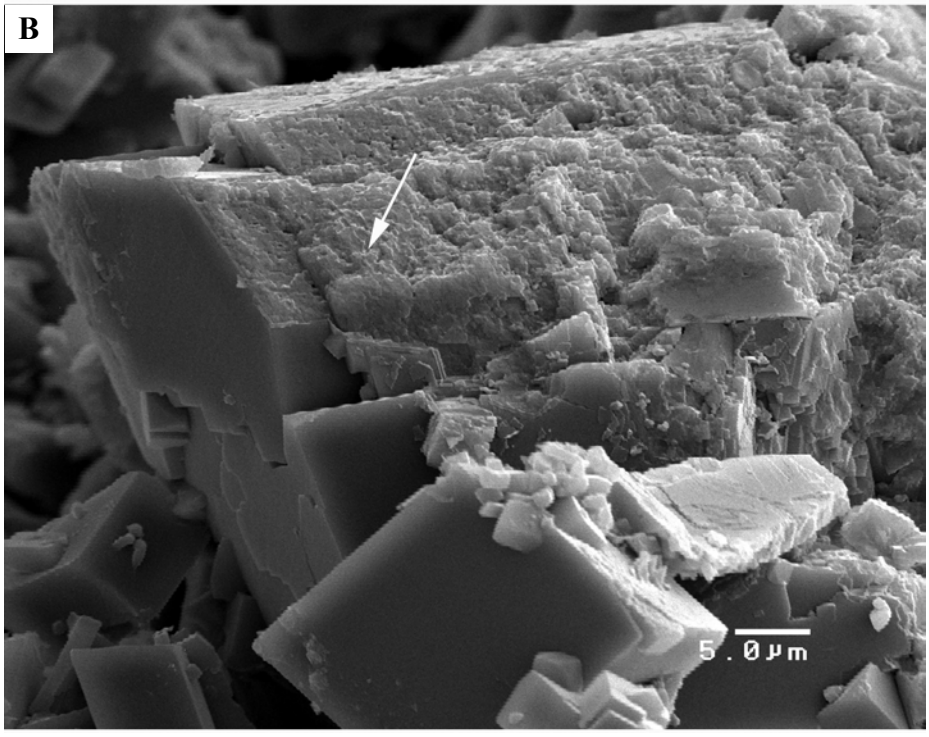
Photomicrograph 1B. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Secondary dolomite partially filling a fracture. Porosity is black. Scale represents 50 microns (0.05 mm).



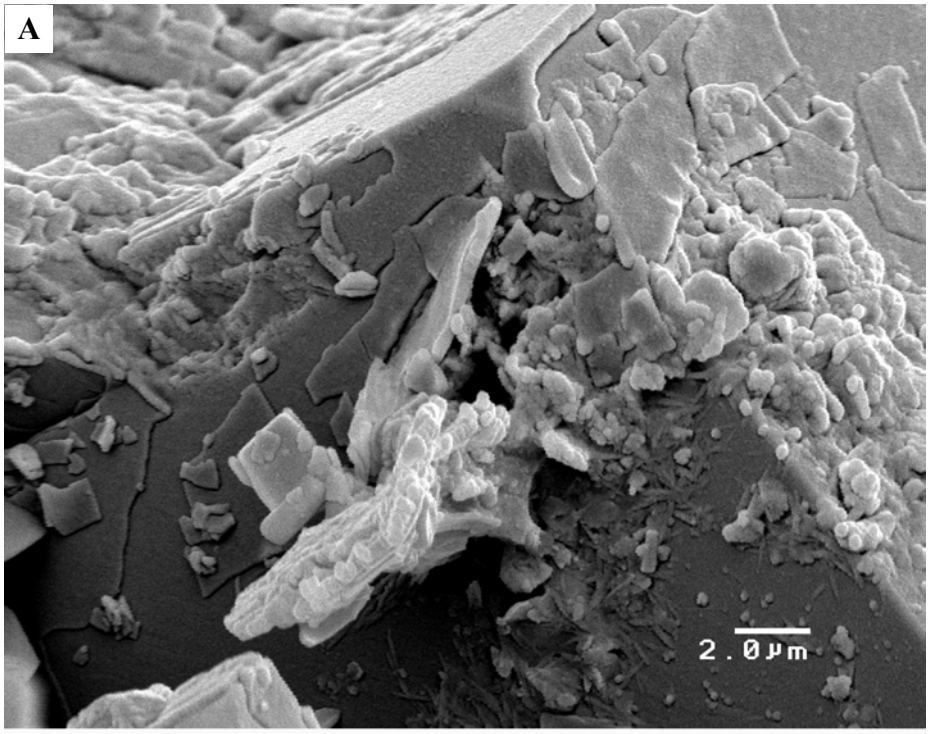
Photomicrograph 2. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Enlargement showing details of intercrystalline porosity-BC (black) among dolomite crystals. Pyrobitumen (arrow) is present on the crystals. Scale represents 5 microns (0.005 mm).



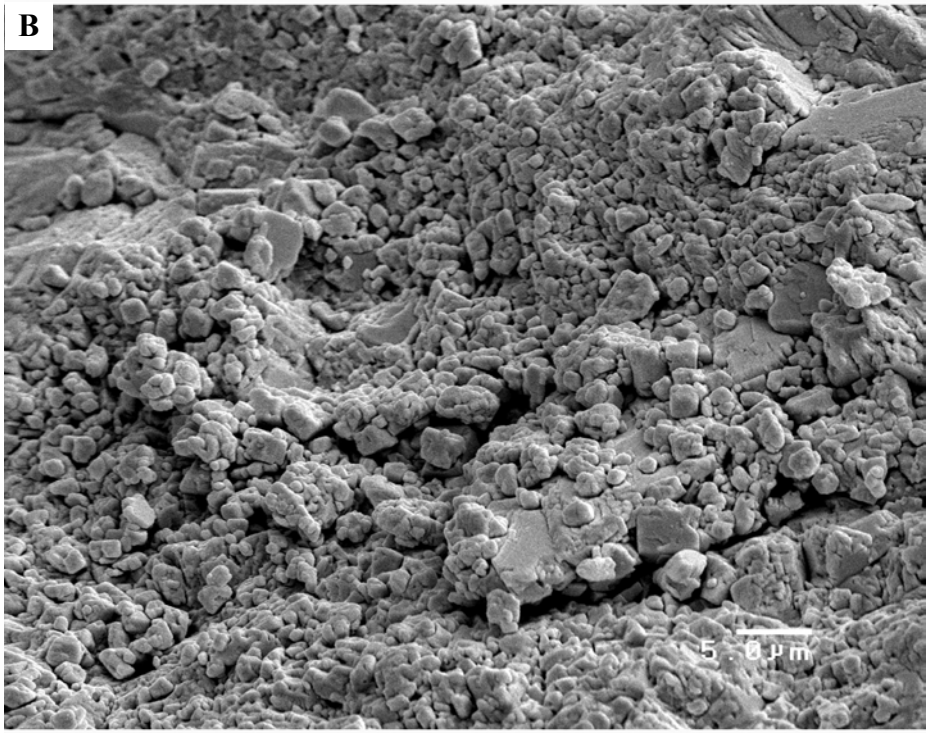
Photomicrograph 3A. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Enlargement showing intercrystalline microporosity–BC (black) associated with dolomite crystals. Pyrobitumen (arrow) is visible on the rhombs. Scale represents 10 microns (0.01 mm)



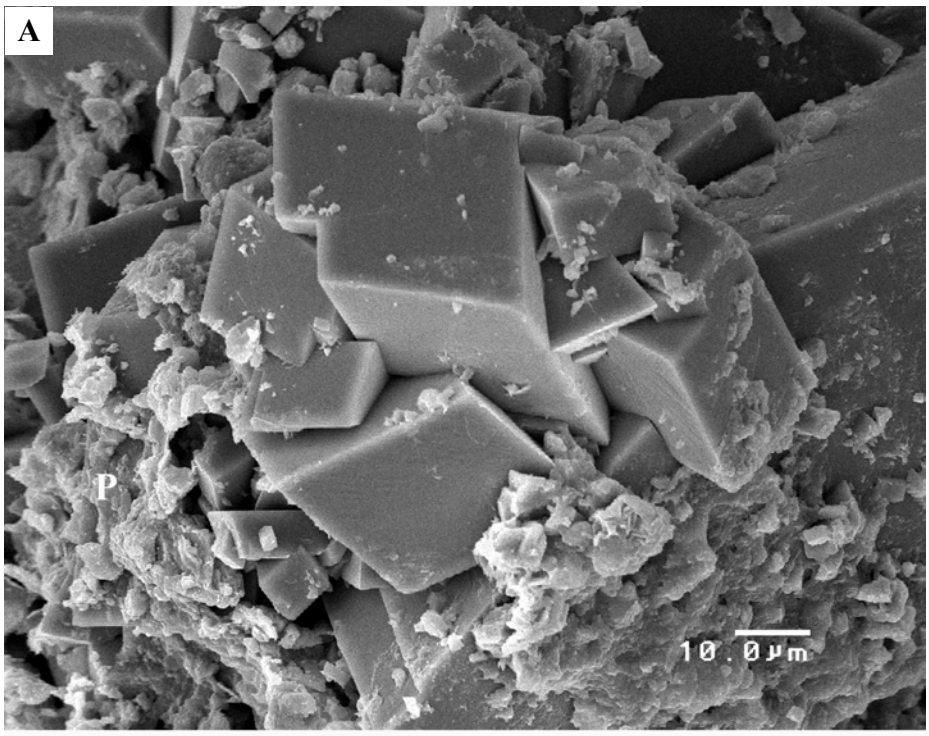
Photomicrograph 3B. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Enlargement. Showing pyrobitumen (arrow) on dolomite rhombs. Scale represents 5 microns (0.005 mm)



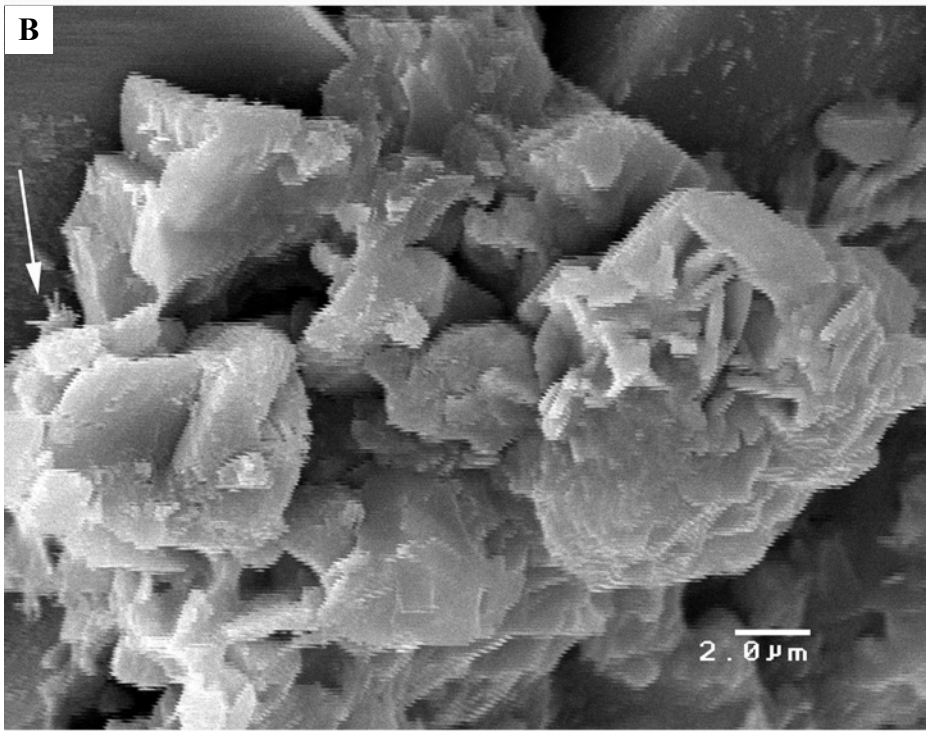
Photomicrograph 4A. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Enlargement showing dolomite crystals partially coated with salt (NaCl). This may be an artifact of drilling. Scale represents 2 microns (0.002 mm)



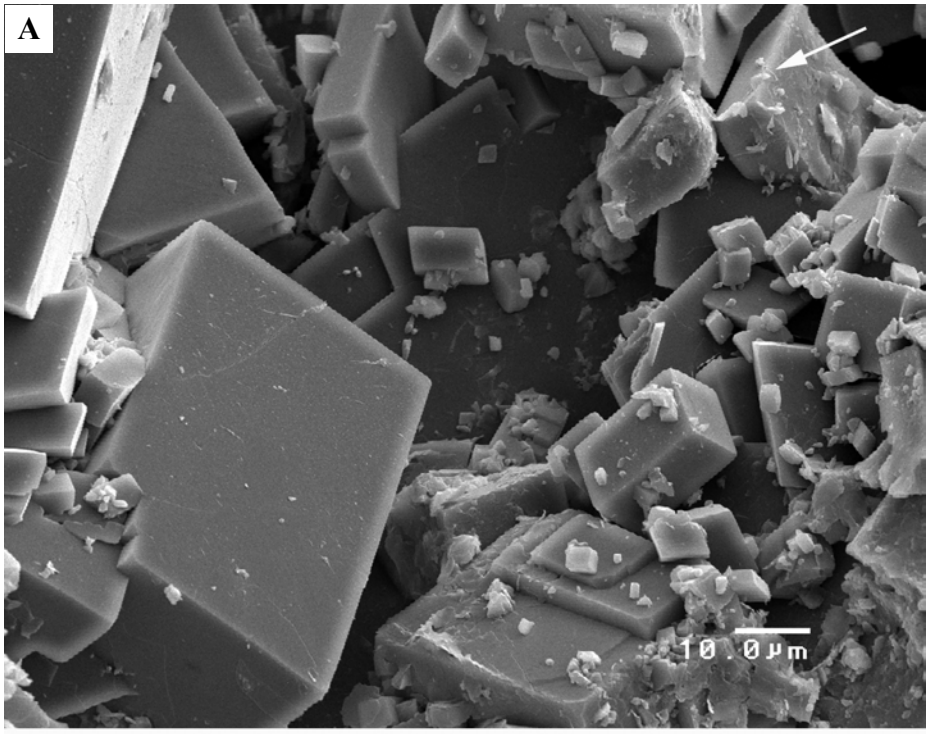
Photomicrograph 4B. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Enlargement showing crystal-coating salt (NaCl). This is most likely an artifact of drilling. Scale represents 5 microns (0.005 mm)



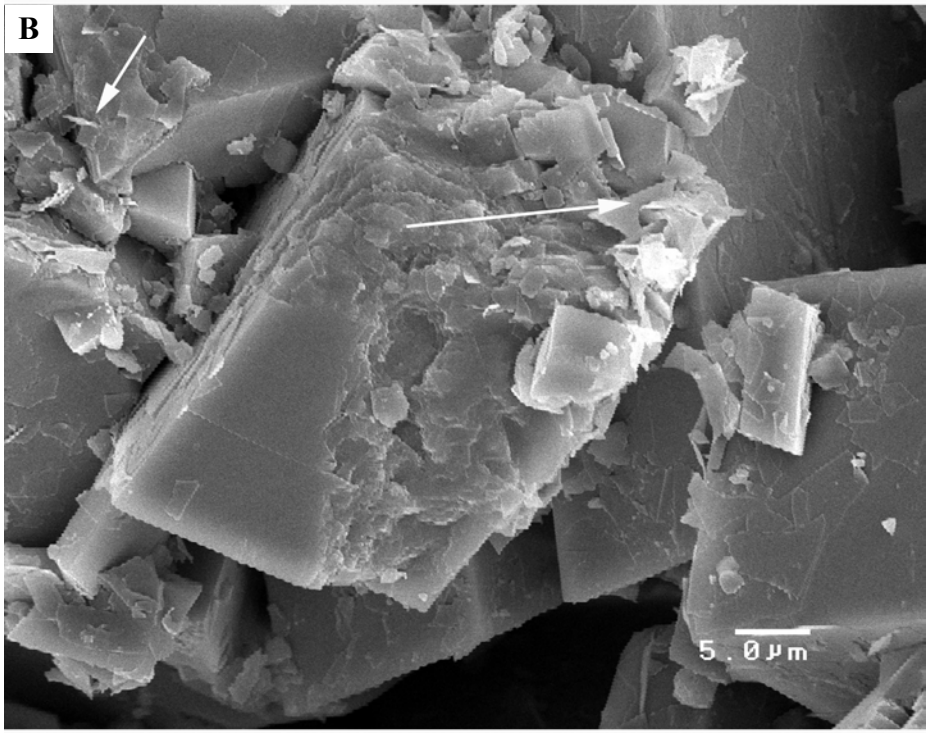
Photomicrograph 5A. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Enlargement showing dolomite crystals with pyrobitumen (P). Black is porosity. Scale represents 10 microns (0.01 mm)



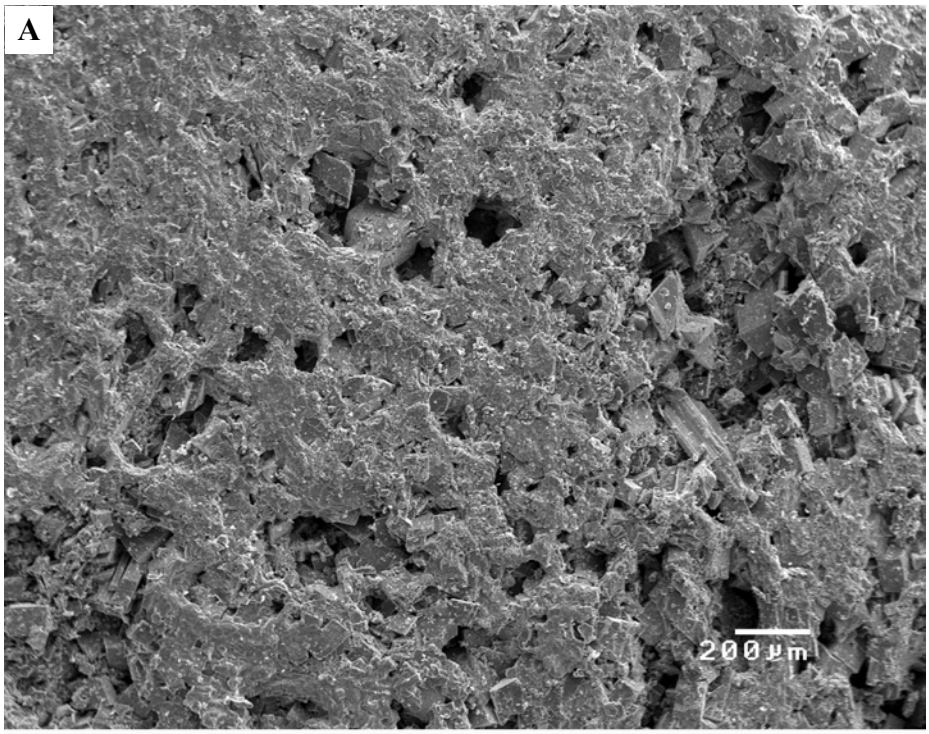
Photomicrograph 5B. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Enlargement showing pyrobitumen adhered to dolomite crystals. Possible fibrous illitic clays (arrow) visible. Scale represents 2 microns (0.002mm)



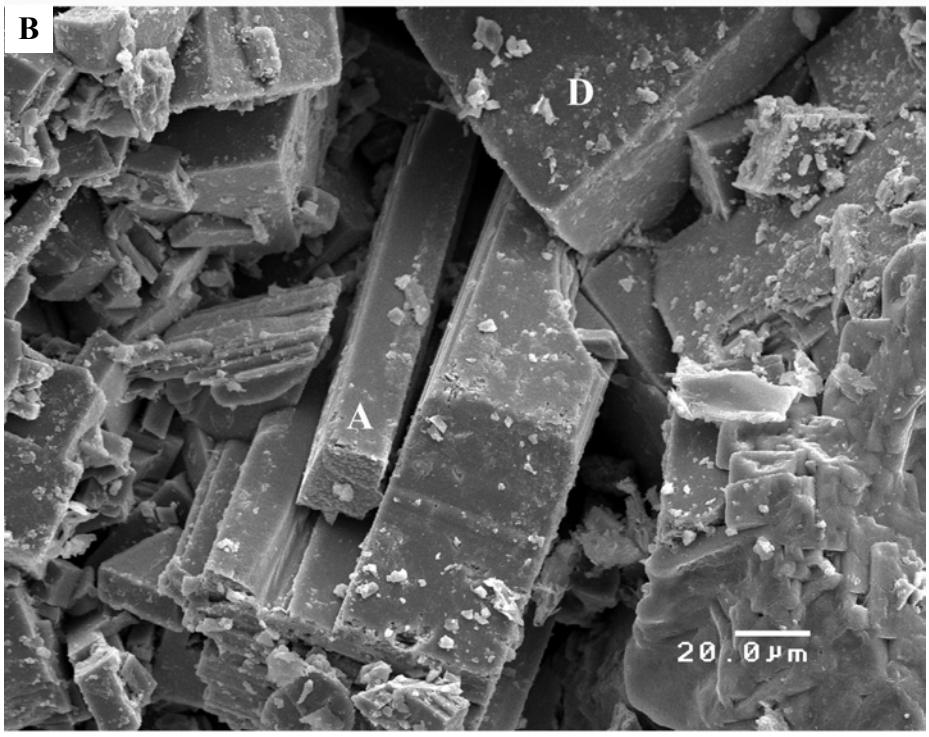
Photomicrograph 6A. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Enlargement of dolomite crystals with intercrystalline-BC porosity visible. Pyrobitumen and/or sulfides (arrow) visible on the dolomite. Scale represents 10 microns (0.01 mm)



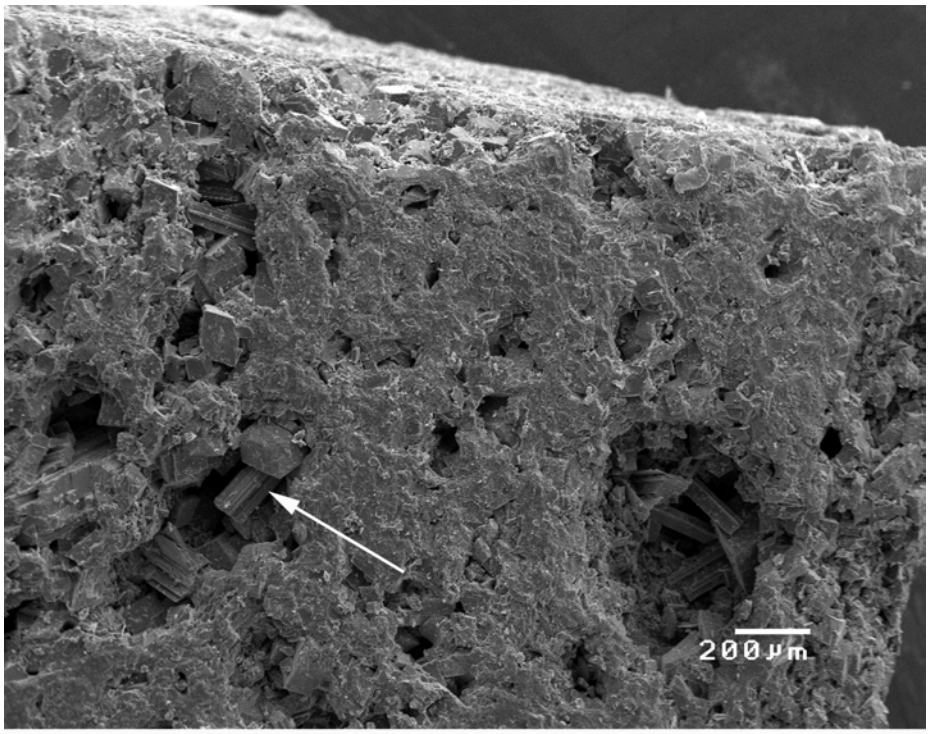
Photomicrograph 6B. Lisbon D-816. SEM photomicrograph of a core plug from 8423'. Enlargement of dolomite crystals with intercrystalline-BC porosity visible. Pyrobitumen and/or sulfides (arrows) visible on the dolomite. Scale represents 5 microns (0.005mm)



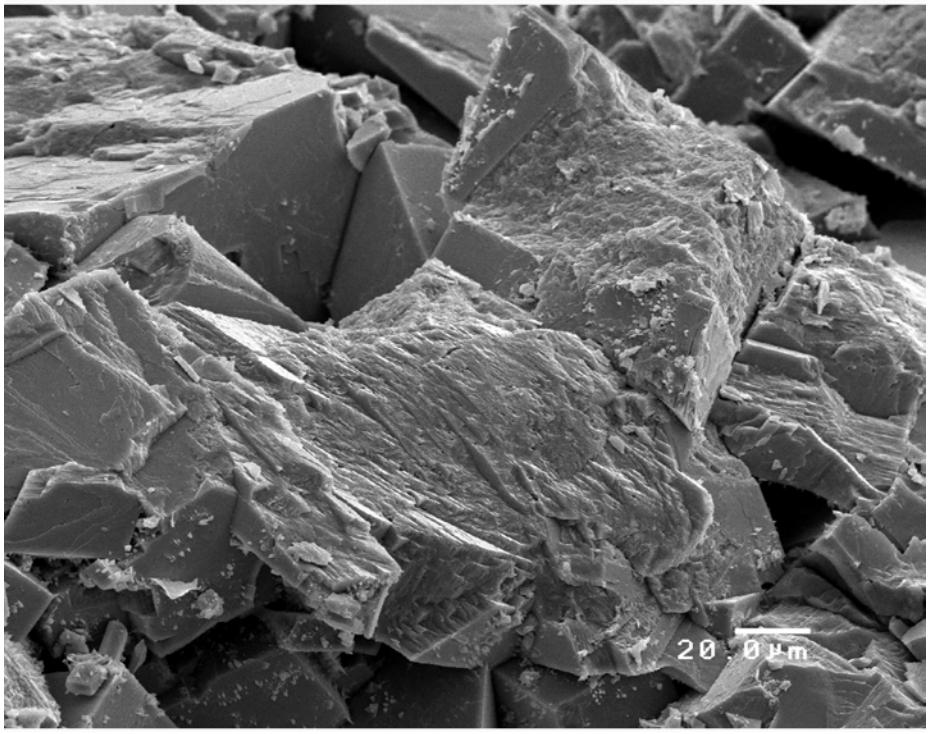
Photomicrograph 1A. Lisbon D-816. SEM photomicrograph of a core chip from 8426-31'. Overall view of dolomite exhibiting mesovuggy-msVUG porosity (black). Note secondary cement-ation in some vugs (right center). Black is porosity. Scale represents 200 microns (0.2 mm).



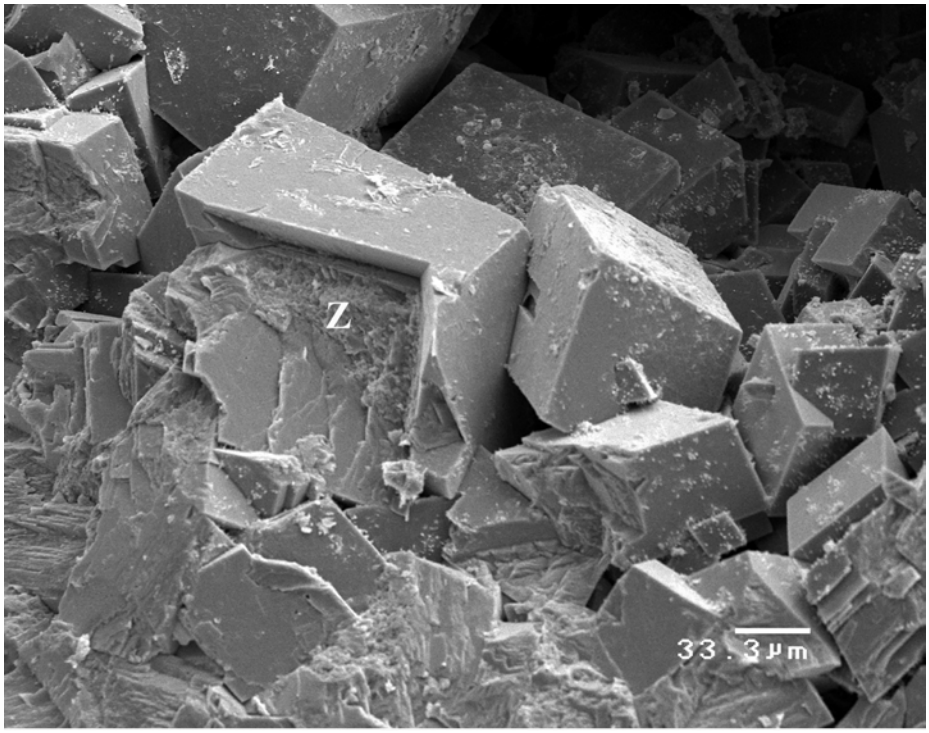
Photomicrograph 1B. Lisbon D-816. SEM photomicrograph of a core chip from 8426-31'. Enlargement of a mesovug showing the anhydrite (A) and dolomite (D) cements partially filling the vug. Black is porosity. Scale represents 20 microns (0.02 mm).



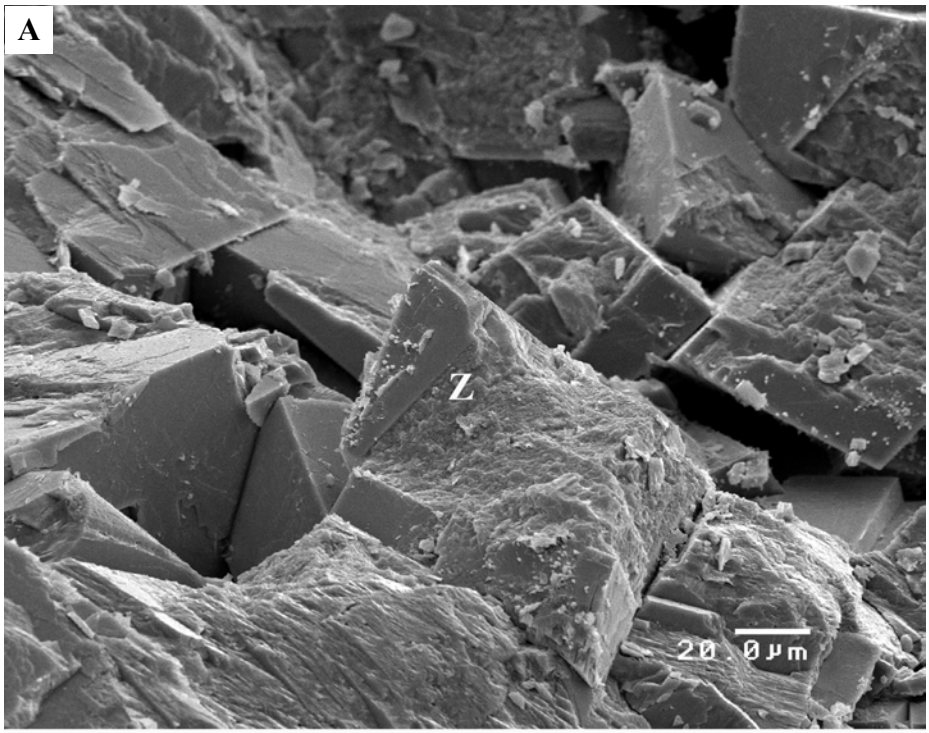
Photomicrograph 2. Lisbon D-816. SEM photomicrograph of a core chip from 8426-31'. Overall view of dolomite exhibiting mesovuggy-msVUG porosity (black). Note secondary cement-ation (arrow) in many vugs. Black is porosity. Scale represents 200 microns (0.2mm).



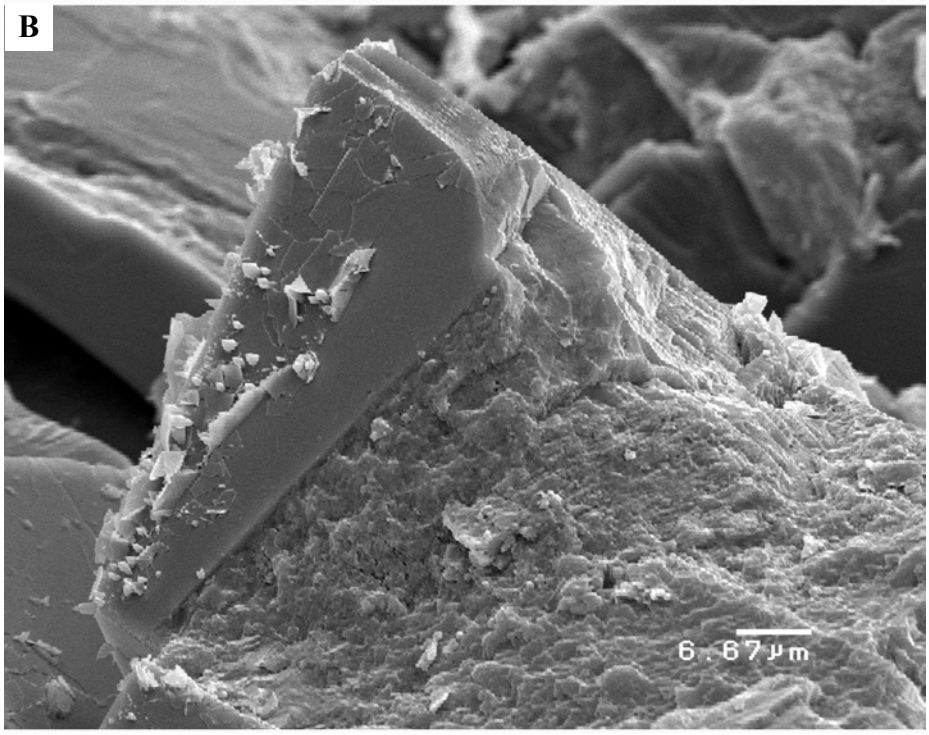
Photomicrograph 1. Lisbon D-816. SEM photomicrograph of a core plug from 8433'. Enlargement showing the cloudy interior of possible saddle dolomite (center). Black is intercrystalline-porosity. Scale represents 20 microns (0.02 mm).



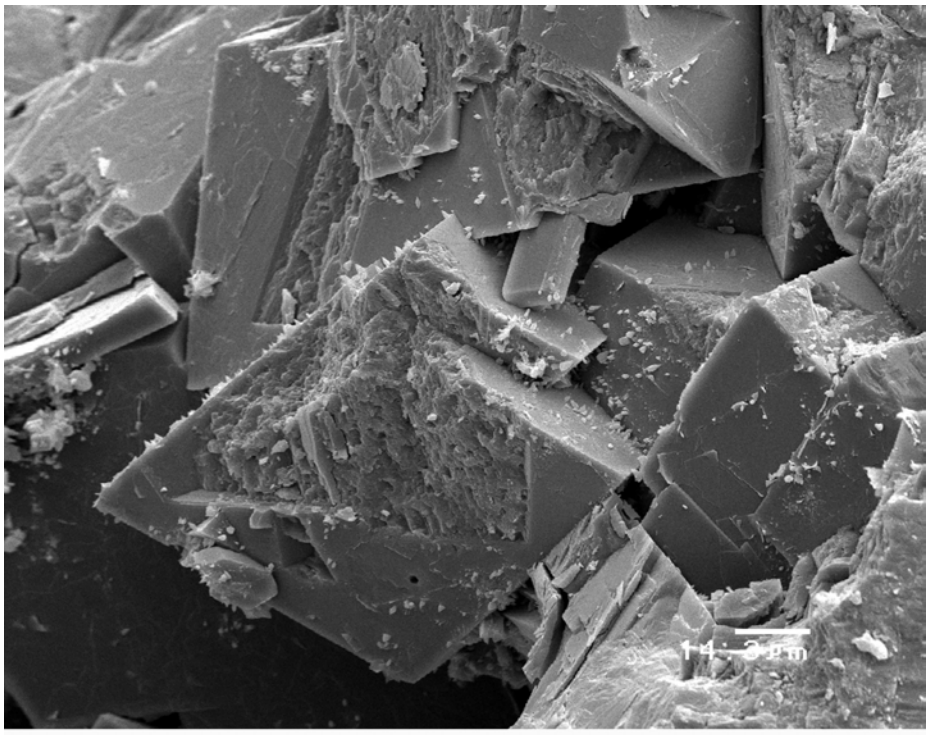
Photomicrograph 2. Lisbon D-816. SEM photomicrograph of a core plug from 8433'. Dolomite crystals. The large crystal (Z) exhibits evidence of zoning. The smooth outer cement differs from the rough textured inner dolomite. Black is intercrystalline-BC porosity. Scale represents 33.3 microns (0.033 mm).



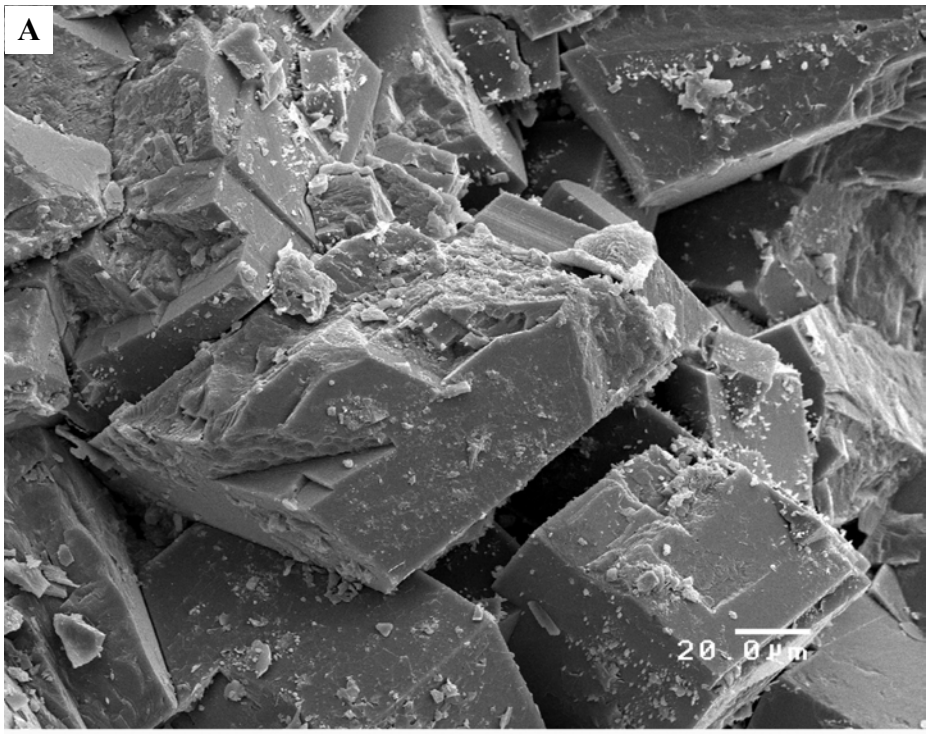
Photomicrograph 3A. Lisbon D-816. SEM photomicrograph of a core plug from 8433'. Zoned dolomite crystals (Z) with intercrystalline-BC porosity (black). Scale represents 20 microns (0.02 mm).



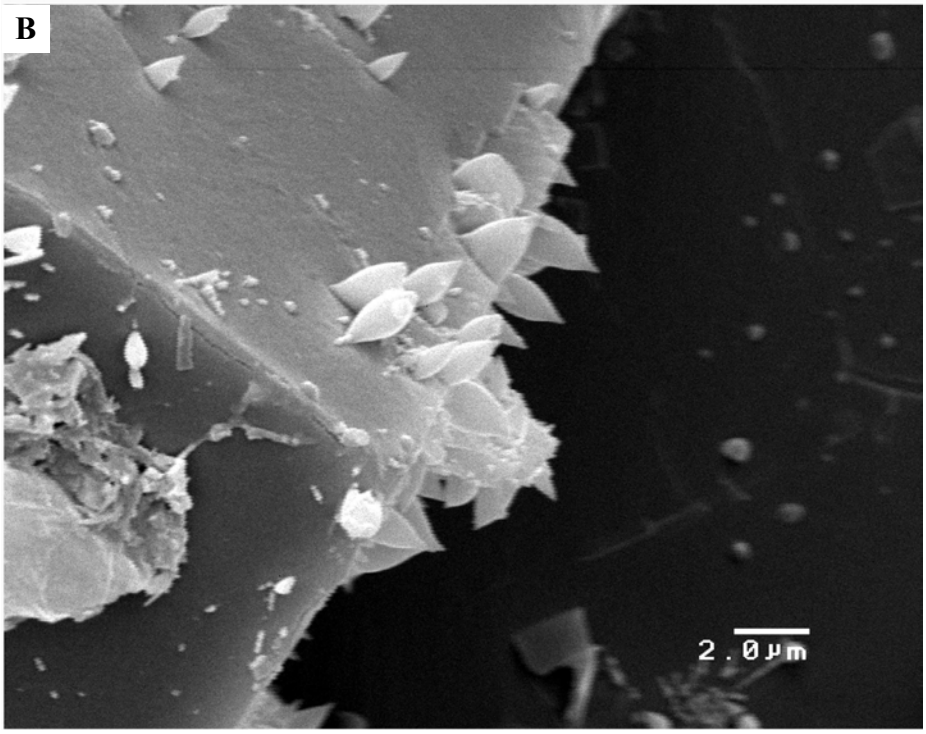
Photomicrograph 3B. Lisbon D-816. SEM photomicrograph of a core plug from 8433'. Enlargement of the center portion of photomicrograph 3A showing the contact between the outer dolomite and the inner core of the crystal. Possibly saddle dolomite. Scale represents 6.67 microns (0.007 mm).



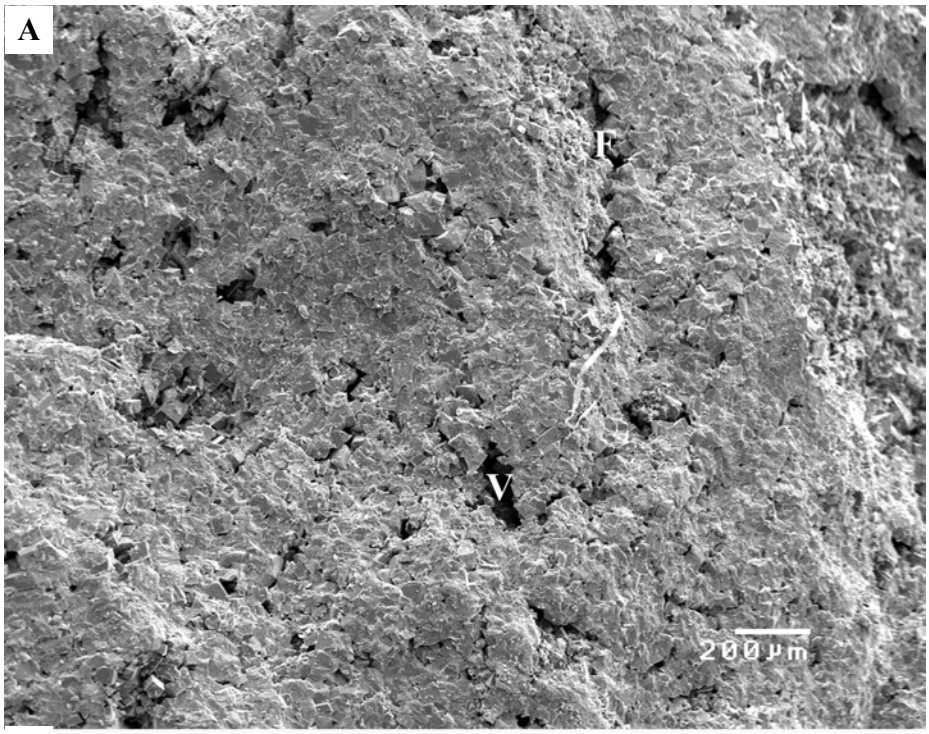
Photomicrograph 4. Lisbon D-816. SEM photomicrograph of a core plug from 8433'. Enlargement of a zoned dolomite crystal showing the contact between the euhedral outer layer and the cloudy interior. Possible saddle dolomite. Scale represents 5 microns (0.005 mm).



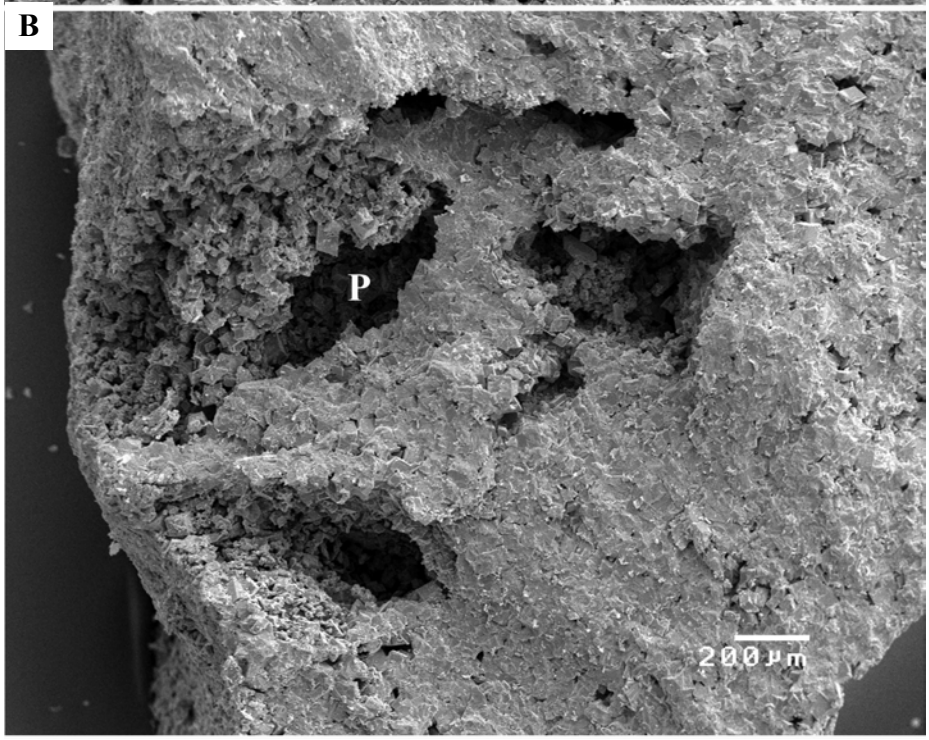
Photomicrograph 5A. Lisbon D-816. SEM photomicrograph of a core plug from 8433'. Enlargement of a zoned dolomite crystal showing the contact between the euhedral outer layer and the cloudy interior. Possible saddle dolomite. Scale represents 20 microns (0.02 mm).



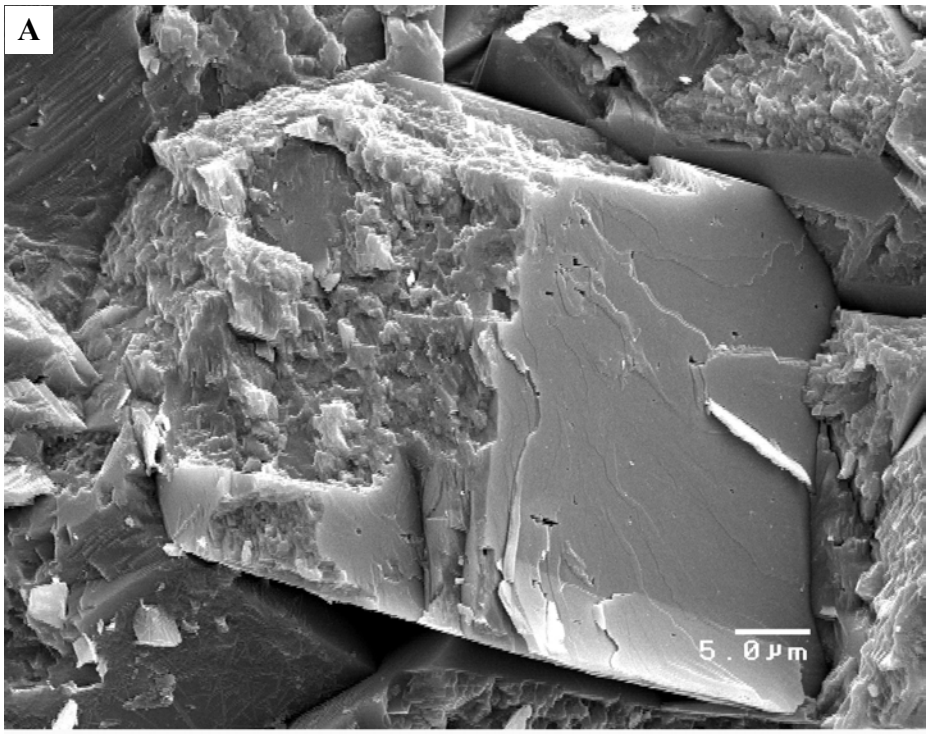
Photomicrograph 5B. Lisbon D-816. SEM photomicrograph of a core plug from 8433'. Enlargement showing the minute crystals formed on dolomite crystals. These crystals are either pyro-bitumen or sulfides. The spherical objects in the background are unidentified, possibly the result of sample preparation. Scale represents 2 microns (0.002 mm).



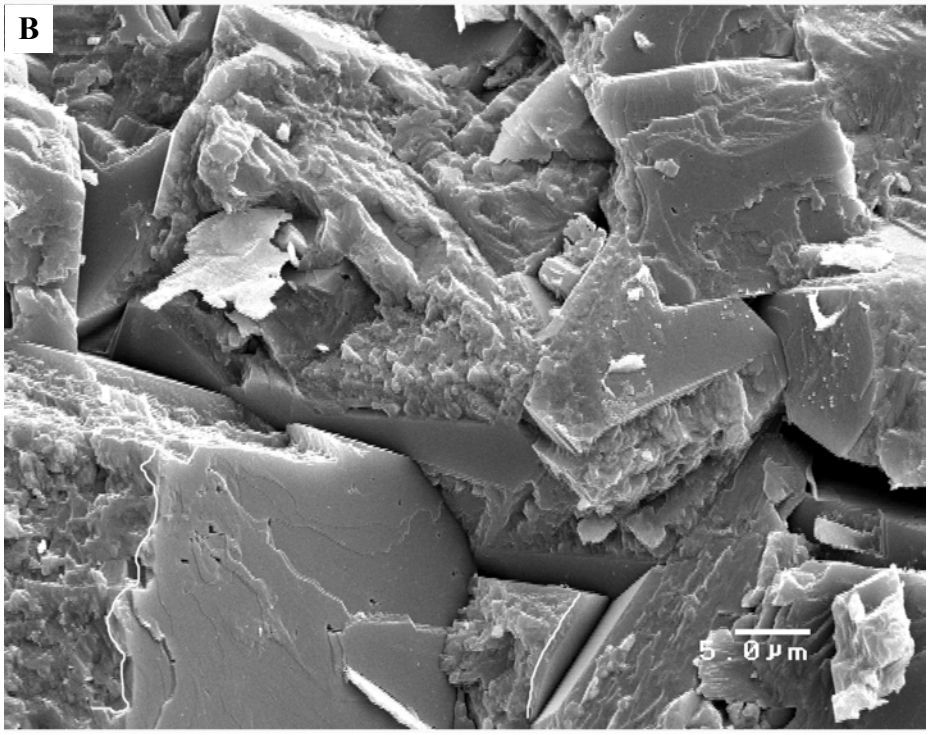
Photomicrograph 1A. Lisbon D-816. SEM photomicrograph of a core plug from 8442-43'. Overview of dolomite exhibiting abundant mesovugs-msVUG (V) and fracture-FR (F) porosity. The linear object in the right center is contamination. Scale represents 200 microns (0.2 mm).



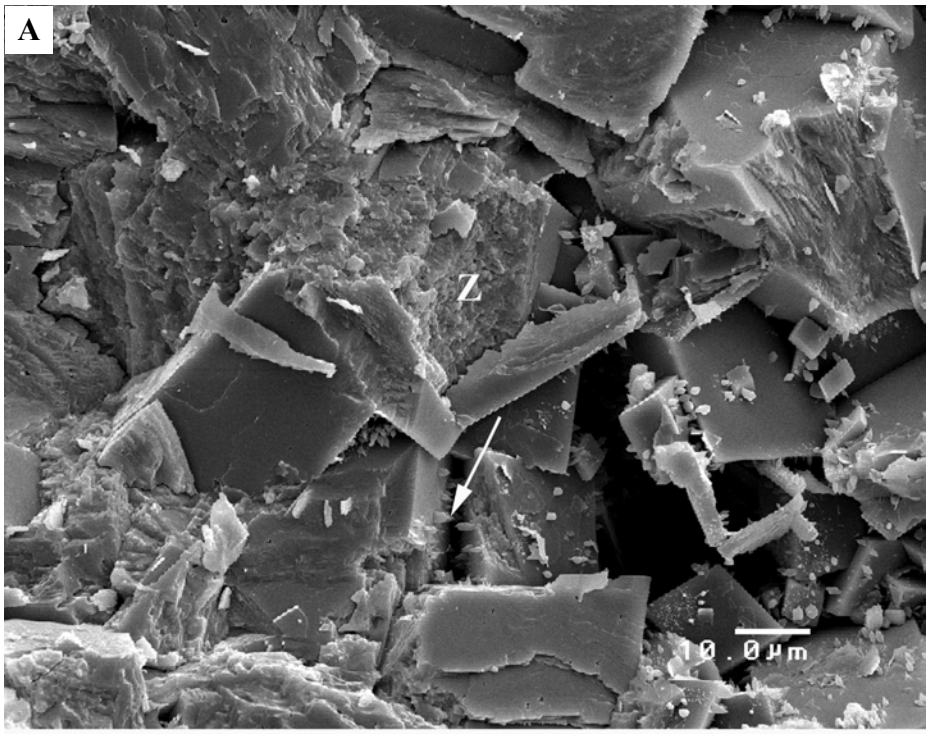
Photomicrograph 1B. Lisbon D-816. SEM photomicrograph of a core plug from 8442-43'. Overview of dolomite containing abundant mesovuggy-msVUG porosity (P). the mesovug on the left is partially filled with secondary dolomite cement. Scale represents 200 microns (0.2 mm).



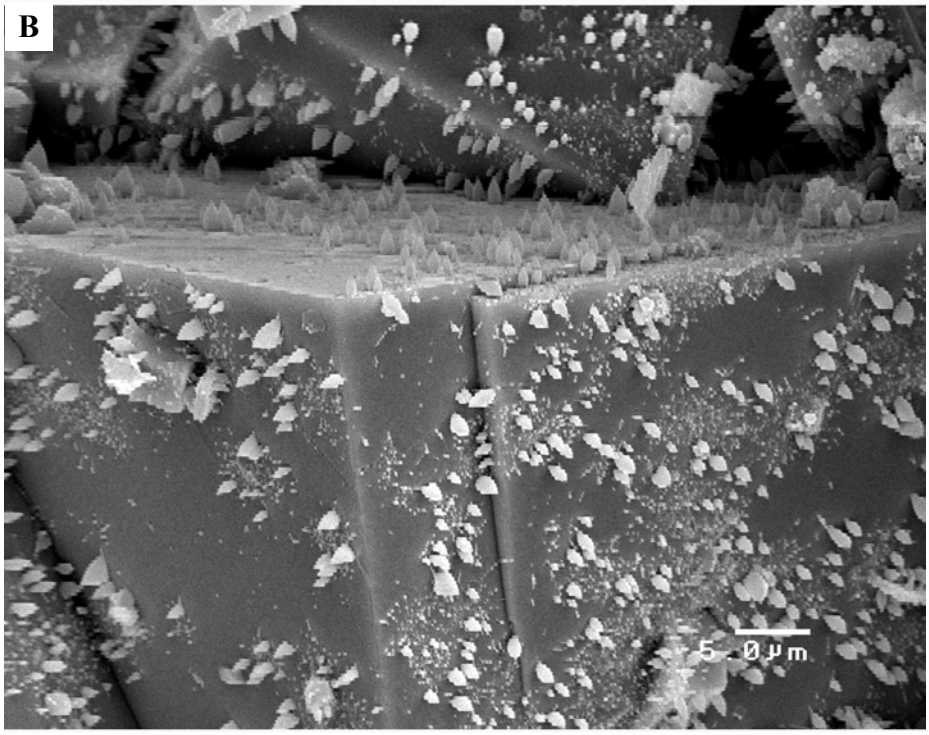
Photomicrograph 2A. Lisbon D-816. SEM photomicrograph of a core plug from 8442-43'. Enlargement showing a zoned dolomite crystal with minor intracrystalline -WP, certainly ineffective, porosity. Scale represents 5 microns (0.005mm).



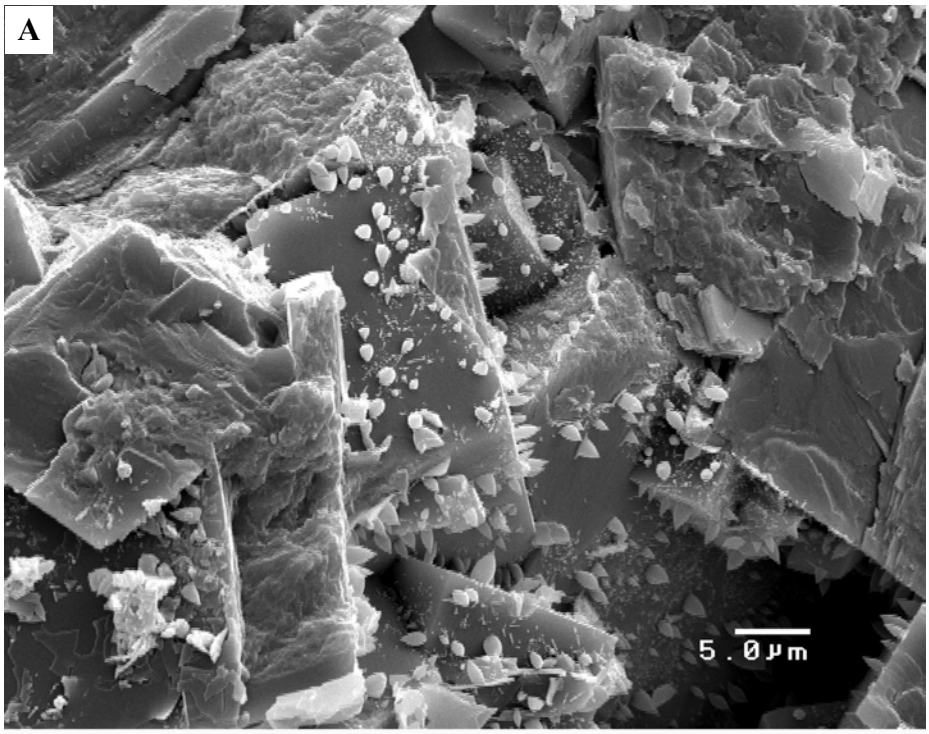
Photomicrograph 2B. Lisbon D-816. SEM photomicrograph of a core plug from 8442-43'. Enlargement showing detail of zoned dolomite crystals. Note the contacts (white line) between the smooth outer cement and the rough-textured inner core. Scale represents 5 microns (0.005 mm).



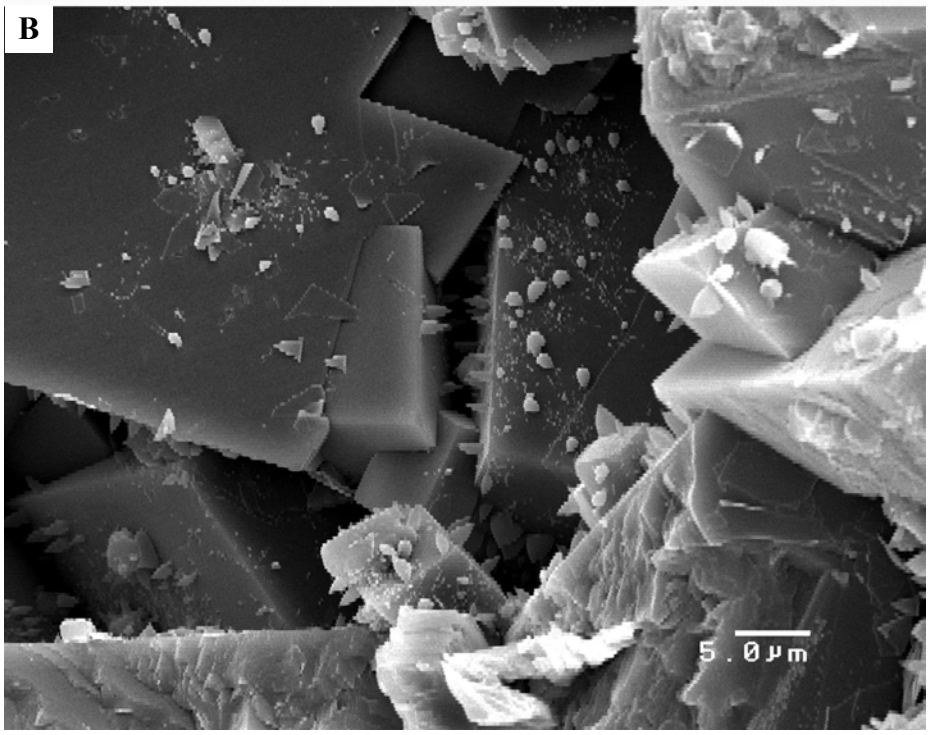
Photomicrograph 3A. Lisbon D-816. SEM photomicrograph of a core plug from 8442-43'. Enlargement showing details of zoned dolomite crystals (Z), intercrystalline-BC porosity (black), and possible minute sulfide crystals (arrow). Scale represents 10 microns (0.01 mm).



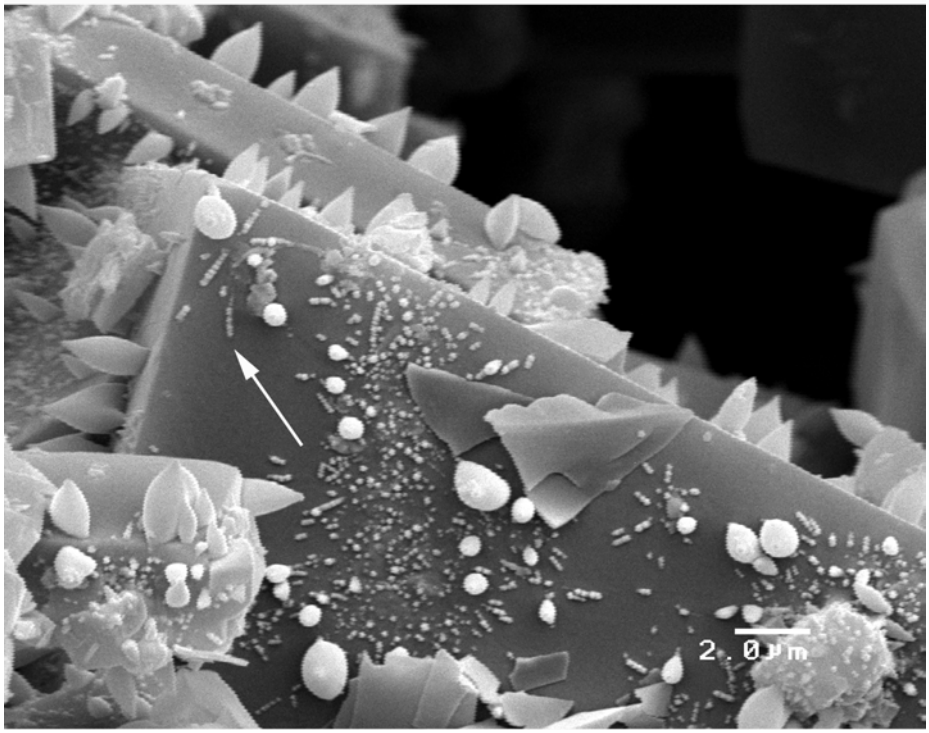
Photomicrograph 3B. Lisbon D-816. SEM photomicrograph of a core plug from 8442-43'. Enlargement showing crystals, possible sulfide minerals, on dolomite crystals. Scale represents 5 microns (0.005 mm).



Photomicrograph 4A. Lisbon D-816. SEM photomicrograph of a core plug from 8442-43'. Enlargement showing crystals, possible sulfide minerals, on dolomite crystals. Black is inter-crystalline-BC porosity. Scale represents 5 microns (0.005 mm).

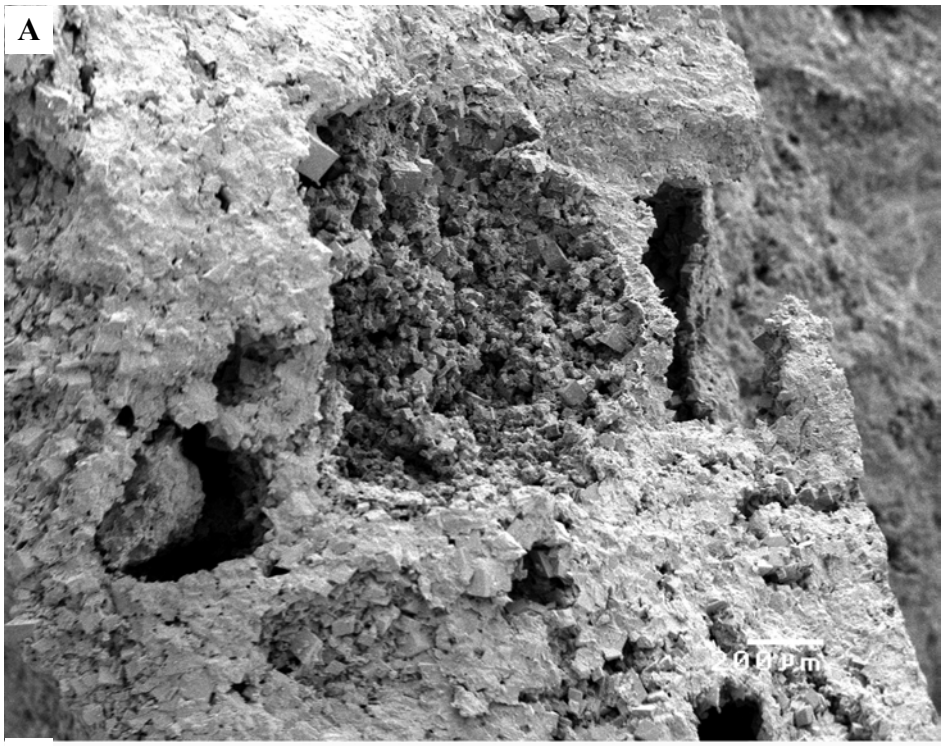


Photomicrograph 4B. Lisbon D-816. SEM photomicrograph of a core plug from 8442-43'. Enlargement showing crystals, possible sulfide minerals, on dolomite crystals. Black is inter-crystalline-BC porosity. Scale represents 5 microns (0.005 mm).



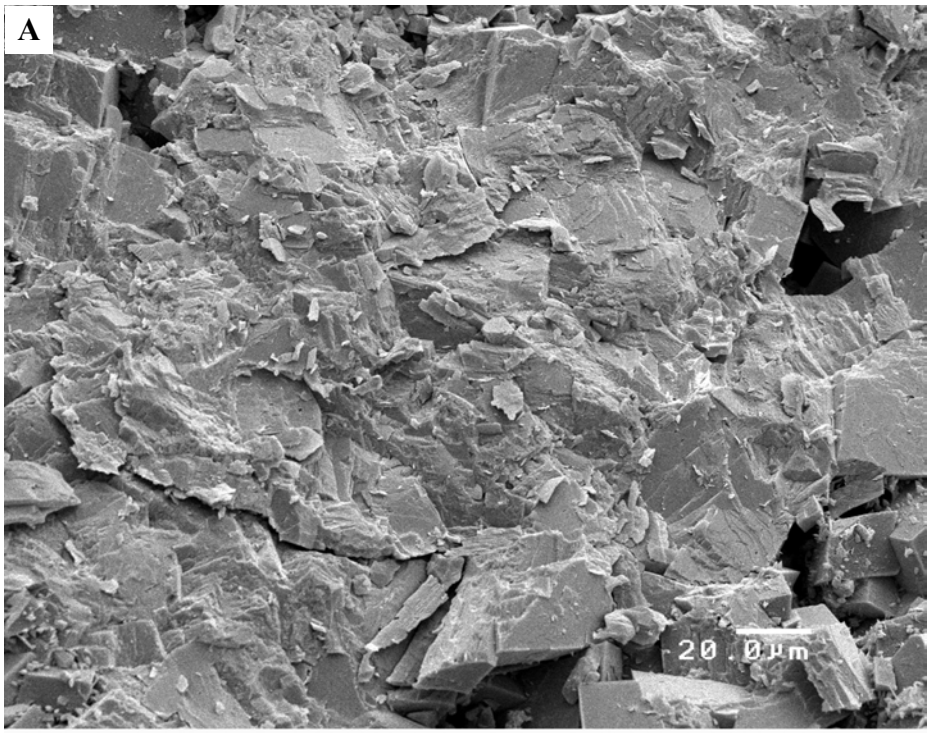
Photomicrograph 5. Lisbon D-816. SEM photomicrograph of a core plug from 8442-43'. Enlargement showing crystals, possible sulfide minerals, on dolomite crystals. Linear features (arrow) possibly pyrobitumen. Black is inter-crystalline-BC porosity. Scale represents 2 microns (0.002 mm).

B-816 WELL,
LISBON FIELD

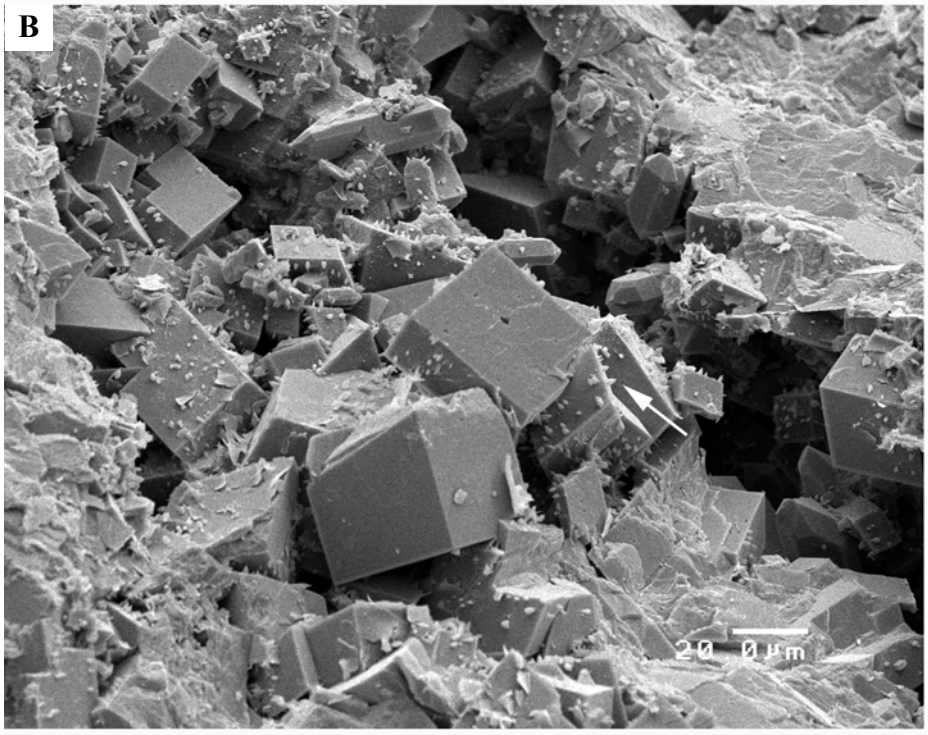


Photomicrograph 1A. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Overview of porous dolomite. Most porosity visible is moldic-MO or vuggy-VUG porosity. Black is porosity. Scale represents 200 microns (0.2 mm).

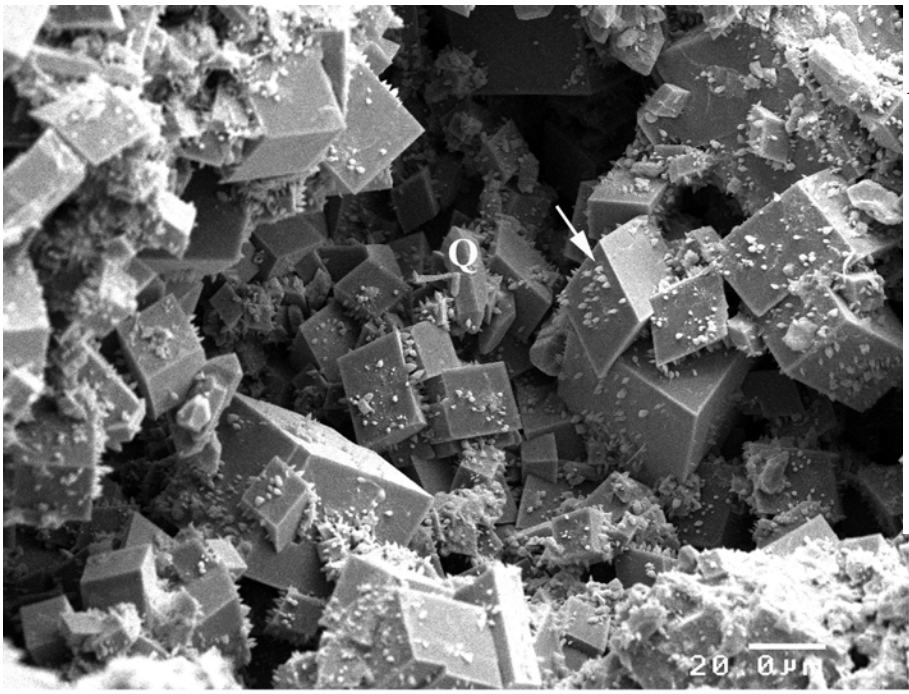
Photomicrograph 1B. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Overview of dolomite with moldic-MO porosity (black). Scale represents 200 microns (0.2mm).



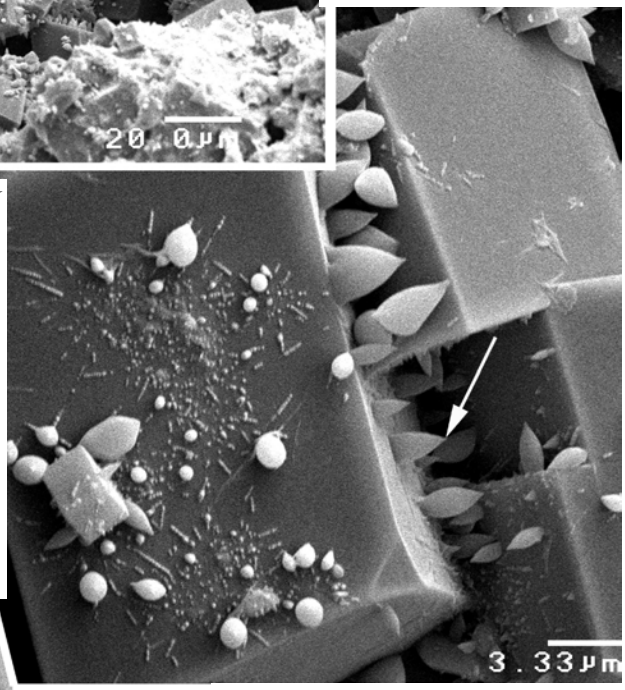
Photomicrograph 2A. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Enlargement of the groundmass dolomite exhibiting little porosity (black). The porosity visible is intercrystalline-BC. Scale represents 20 microns (0.02 mm).



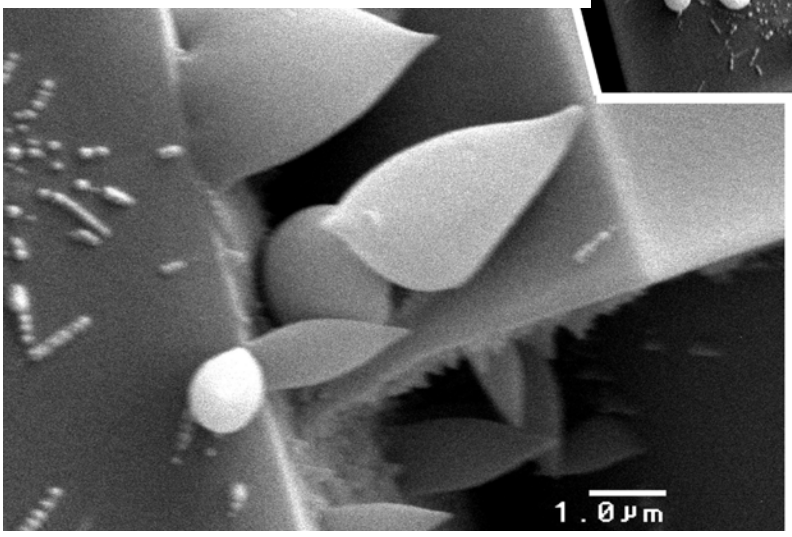
Photomicrograph 2B. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Enlargement showing dolomite crystals within moldic-MO pore. The dolomite crystals have minute crystals (arrow), possibly sulfides on them. Black is porosity. Scale represents 20 microns (0.02 mm).



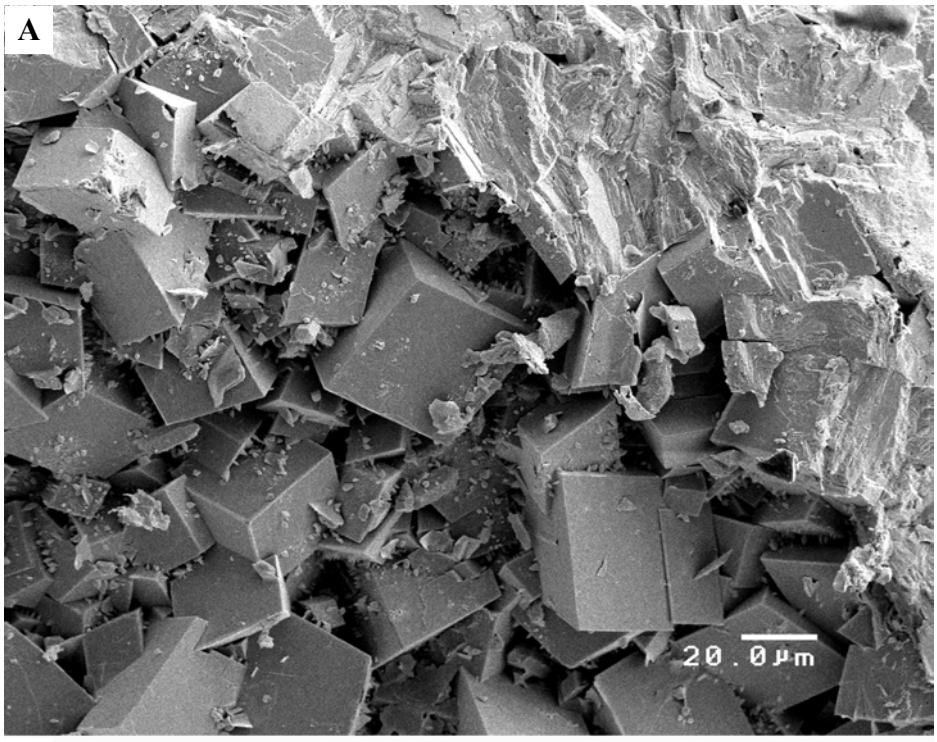
Photomicrograph 3A. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Enlargement showing dolomite and quartz (Q) crystals within moldic-MO pore. The dolomite crystals have minute crystals (arrow), possibly sulfides, on them. Black is porosity. Scale represents 20 microns (0.02 mm).



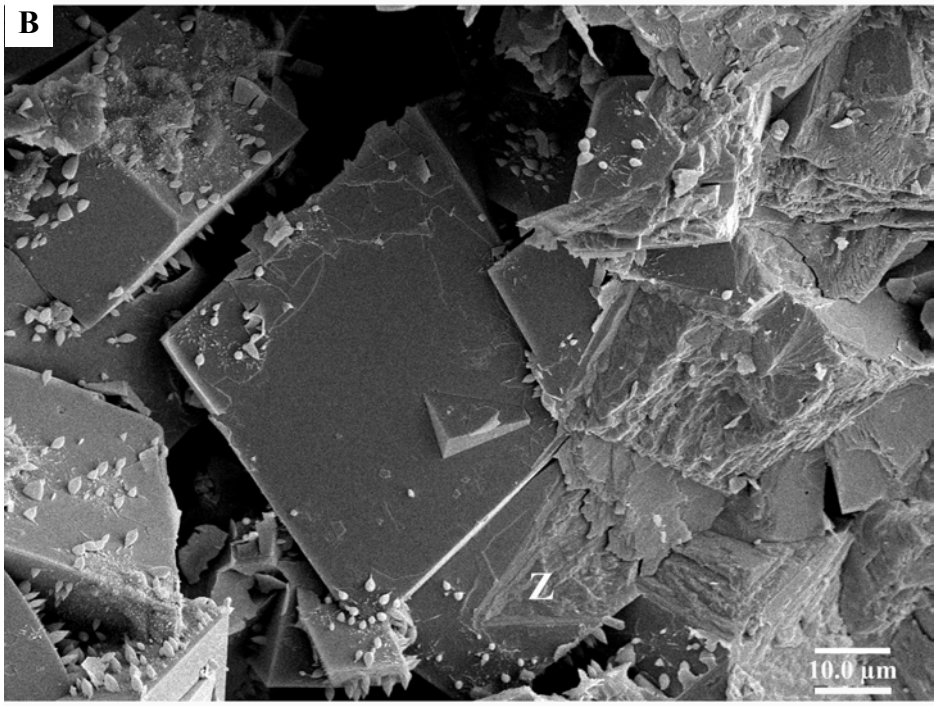
Photomicrograph 3B. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Enlargement of dolomite crystals; the curved crystal surfaces indicate this is saddle dolomite. The dolomite contains minute crystals (arrow) of either pyrobitumen or sulfides. The linear features on the dolomite are also either sulfides or pyrobitumen. Positive identification is indeterminate. Scale represents 3.33 microns (0.003 mm).



Photomicrograph 3C. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Enlargement of minute crystals and linear features from photomicrograph 3B. Scale represents 1 micron (0.001 mm).

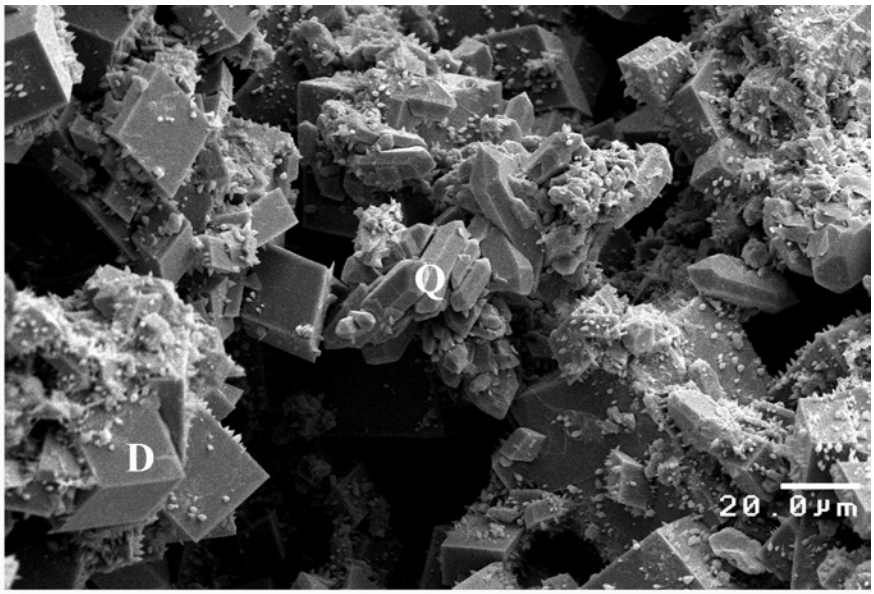


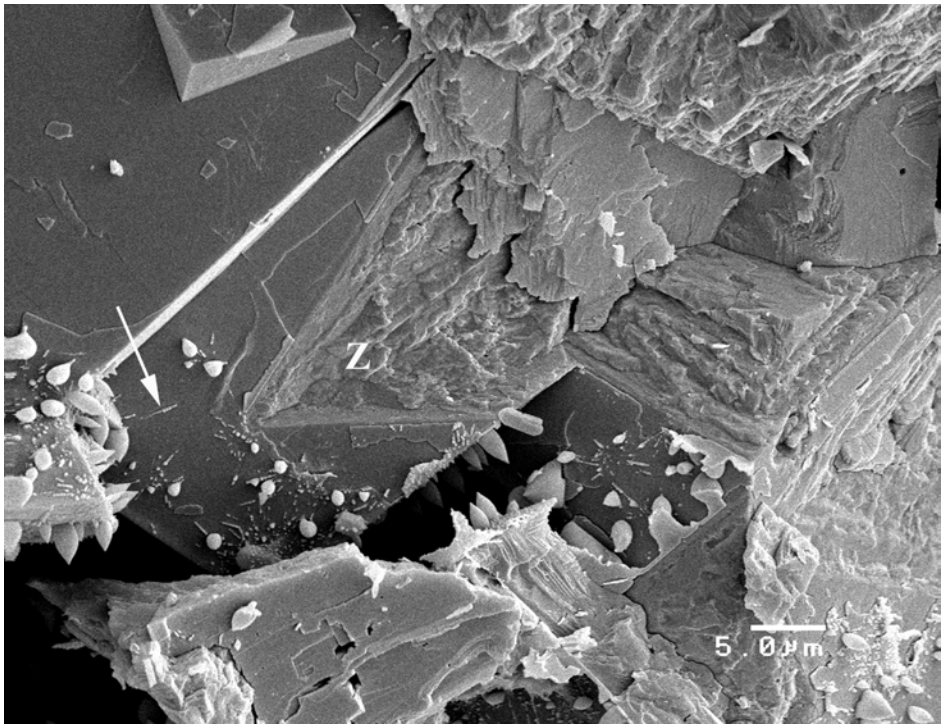
Photomicrograph 4A. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Enlargement showing contact between porous dolomite (saddle dolomite?) below and tight groundmass above. Black is porosity. Scale represents 20 microns (0.02 mm).



Photomicrograph 4B. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Enlargement showing possible saddle dolomite with minute crystals of either pyrobitumen or sulfides on them. Note the zoning evidenced in the lower center (Z). Black is porosity. Scale represents 10 microns (0.01 mm).

Photomicrograph 5. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Dolomite (D) and euhedral quartz cement (Q) formed in a moldic-MO pore. Black is porosity. Scale represents 20 microns (0.02 mm).





Photomicrograph 6. Lisbon B-816. SEM photomicrograph of a core chip from 8486'. Enlargement showing details of zoned calcite crystals (Z) with possible pyrobitumen or sulfides (arrow) present. Black is porosity. Scale represents 5 microns (0.005 mm).

THIN SECTION EPIFLUORESCENCE AND DESCRIPTIONS

B-63 WELL,
LISBON FIELD

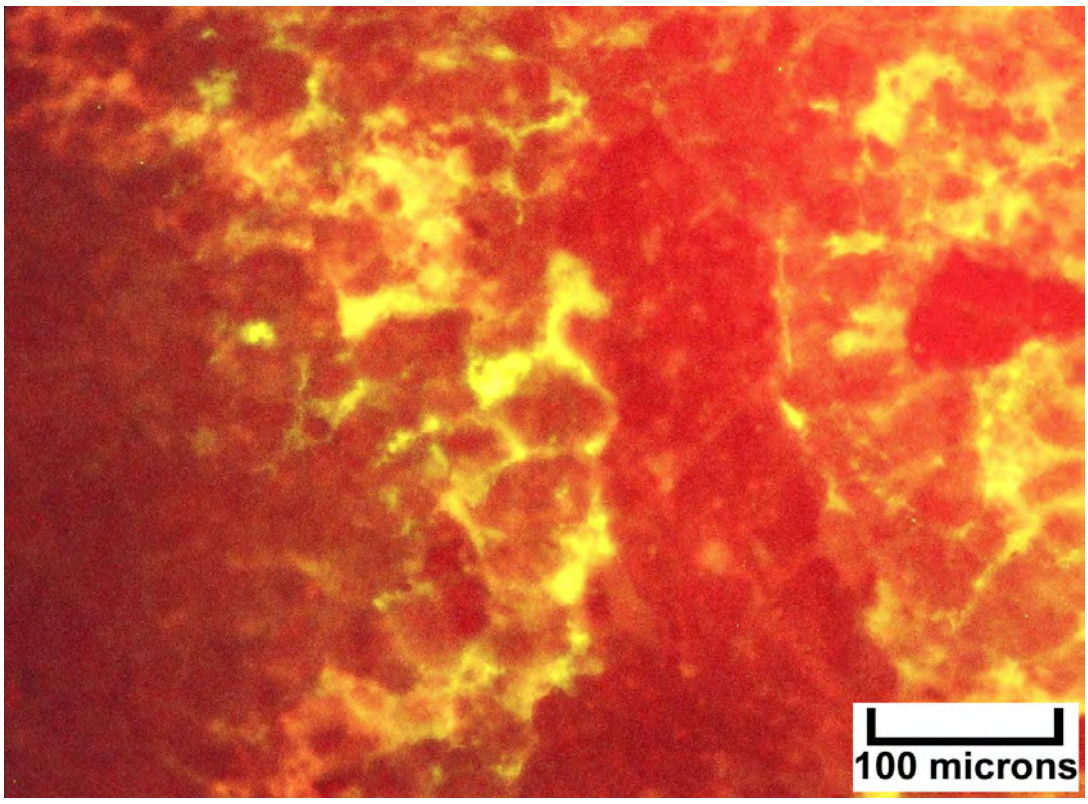
9935 feet

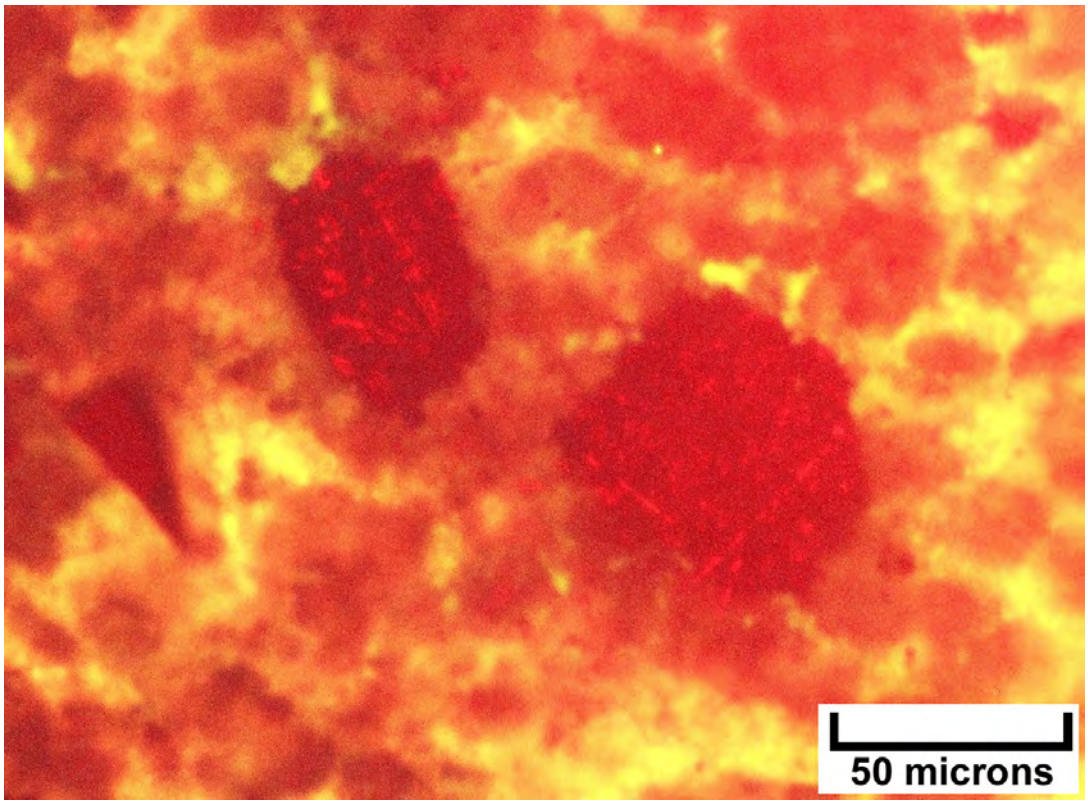
Top Photomicrograph

Epifluorescence nicely shows components of the karst cavity infilling (can see grain outlines with fluorescence); clay minerals between grains display a pale reddish fluorescence. This image displays large, dolomitized, detrital angular limestone (pellets) and syngenetic dolomite clasts in karst cavity (clasts do not fluoresce). Outside of the cavity, the host rock is almost pure limestone composed of fossils and coated grains – all calcitic with little visible fluorescence.

Bottom Photomicrograph

In this image epifluorescence shows fluorescent matrix clays and "dead" replacement sulfide minerals.

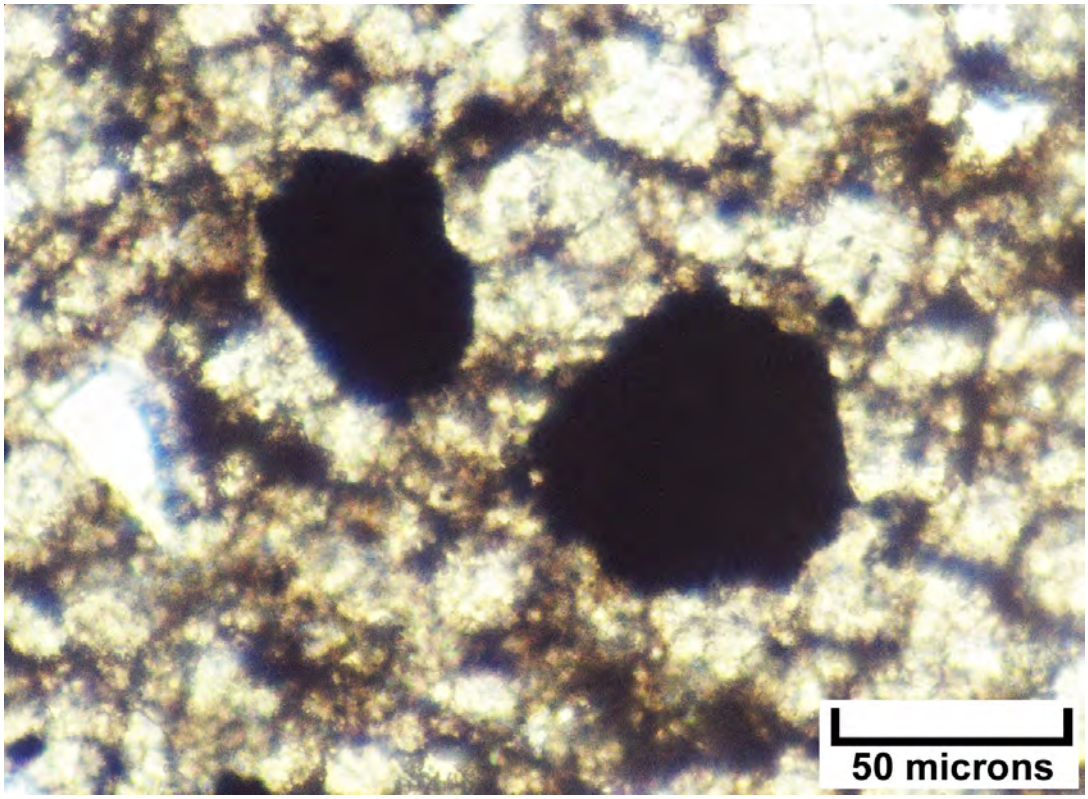

100 microns


50 microns

9935 feet

Top Photomicrograph

Same view under plane light as bottom photograph on previous page .


50 microns

D-616 WELL,
LISBON FIELD

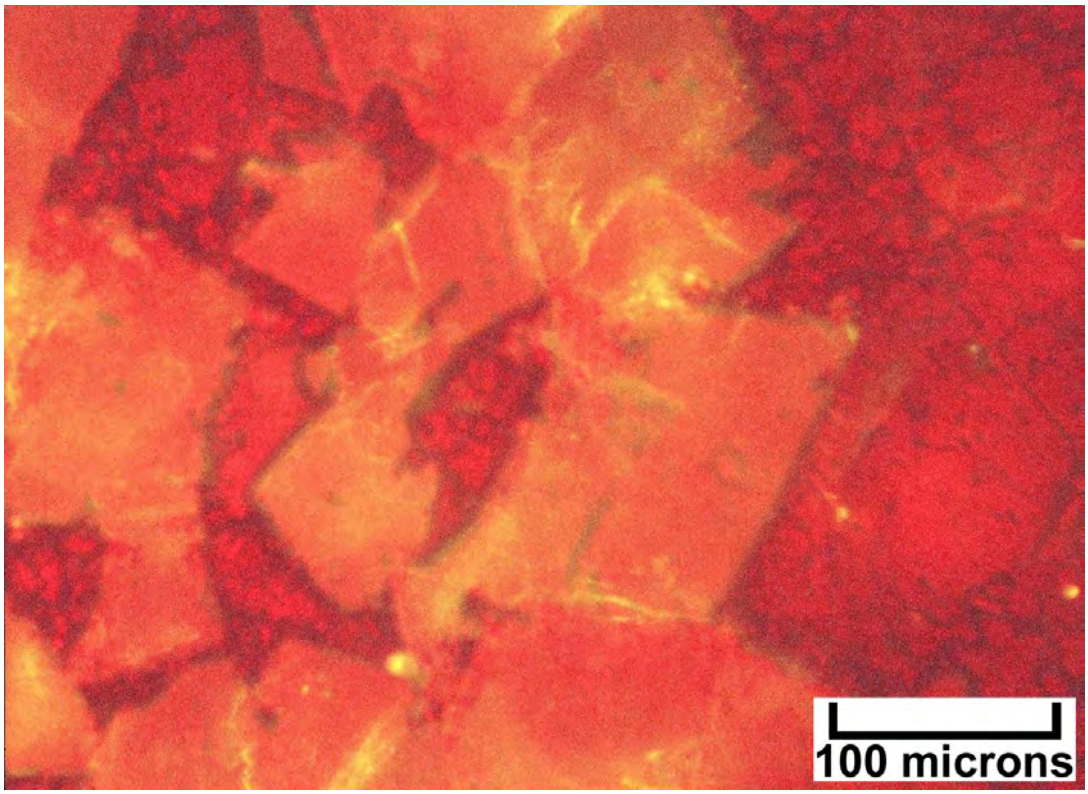
8372 feet

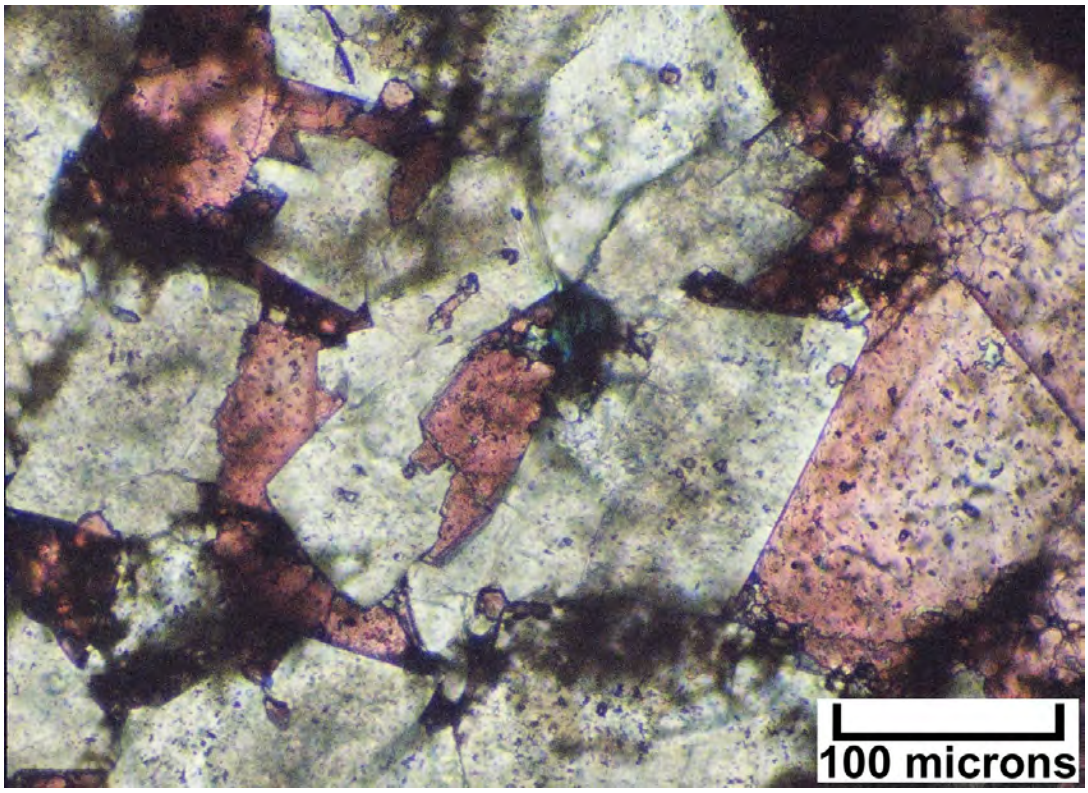
Top Photomicrograph

Epifluorescence shows replacement dolomite is fine to medium crystalline with planar to curved crystal faces, weakly yellow fluorescence; limestone does not fluoresce. In this view possible saddle dolomite is replacing crinoidal limestone. Note weakly fluorescent replacement dolomite.

Bottom Photomicrograph

Same view under plane light as top photograph.

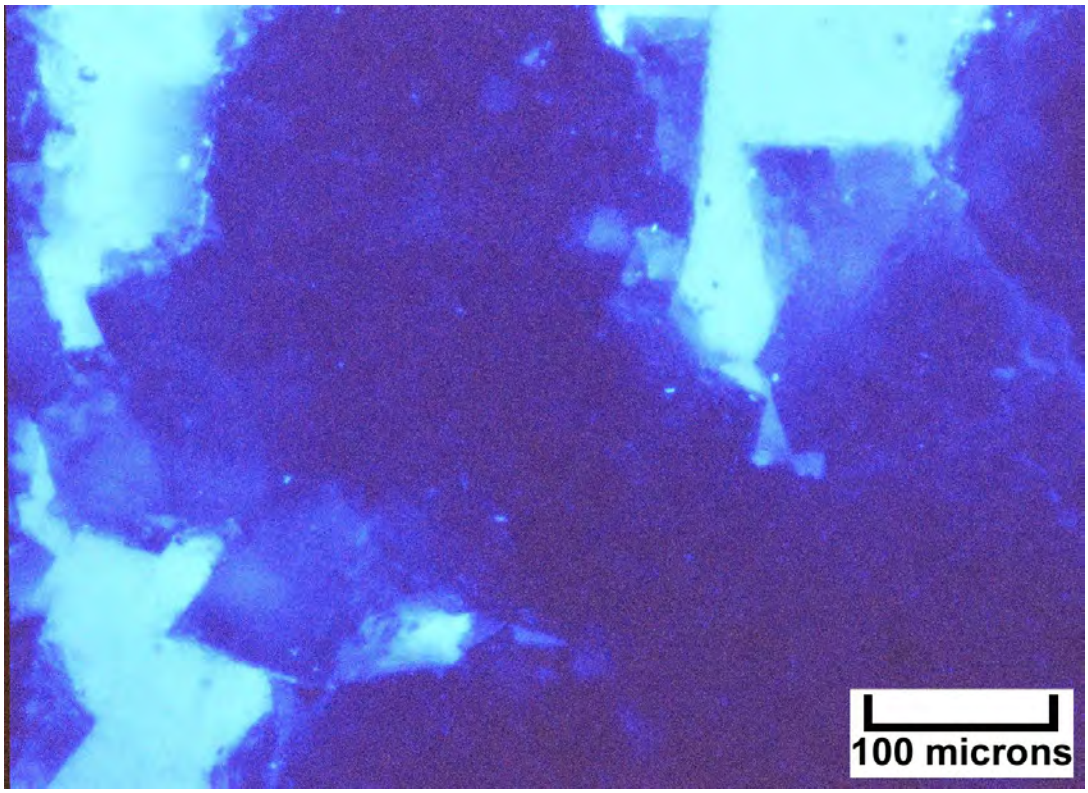

100 microns


100 microns

8380 feet

Top Photomicrograph

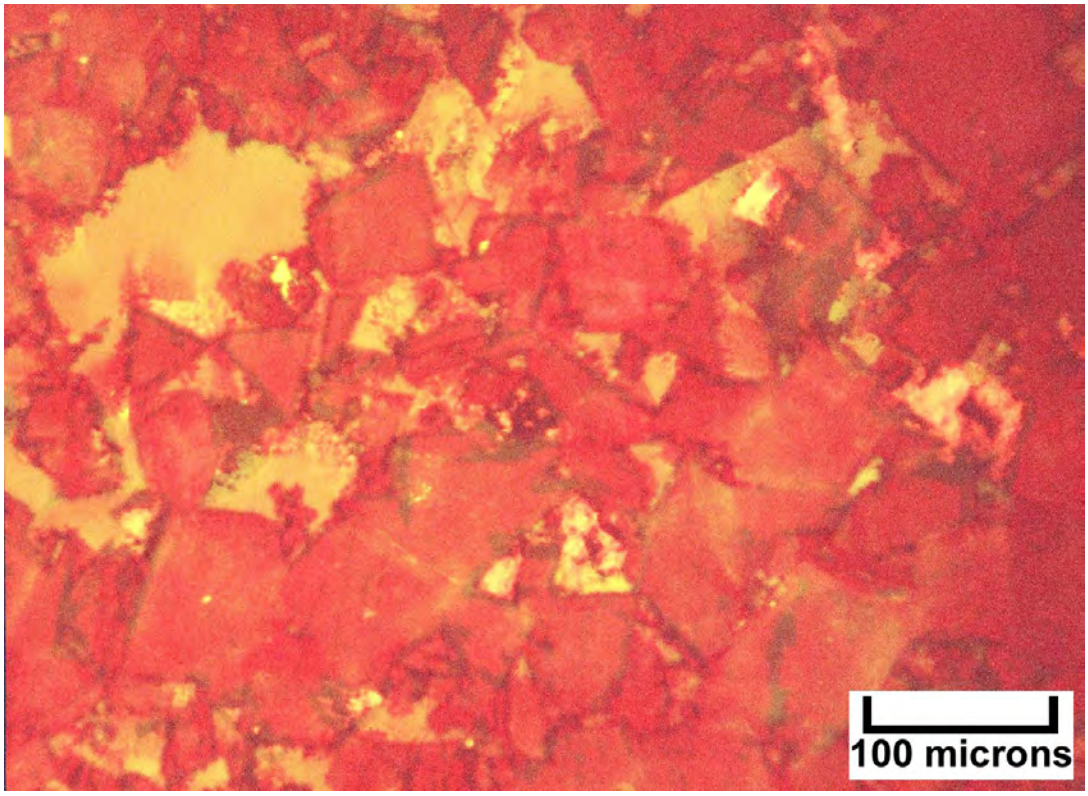
Ultraviolet light shows saddle dolomite cements growing into some of the molds. This image displays moderately dull blue fluorescence in non-fluorescent dolomite matrix.


100 microns

8559 feet

Top Photomicrograph

Epifluorescence in this image clearly shows the replacement dolomite rhombic outlines with high intercrystalline porosity despite appearance of significant bitumen plugging.


100 microns

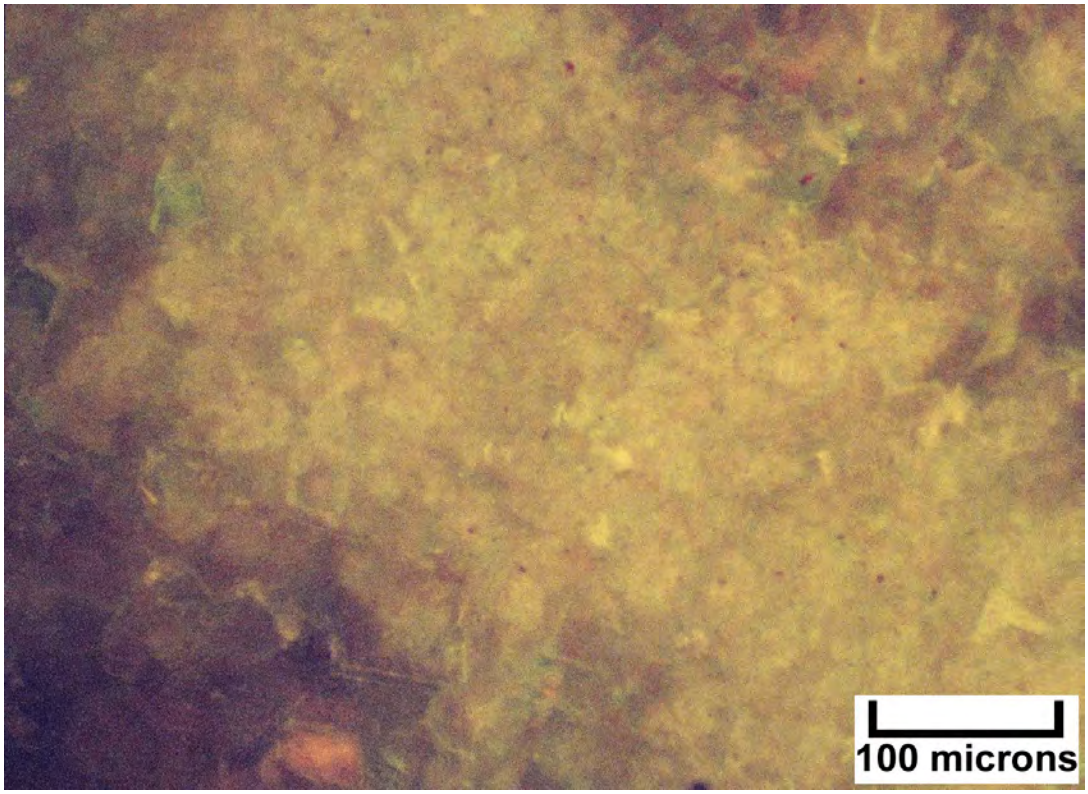
8682 feet

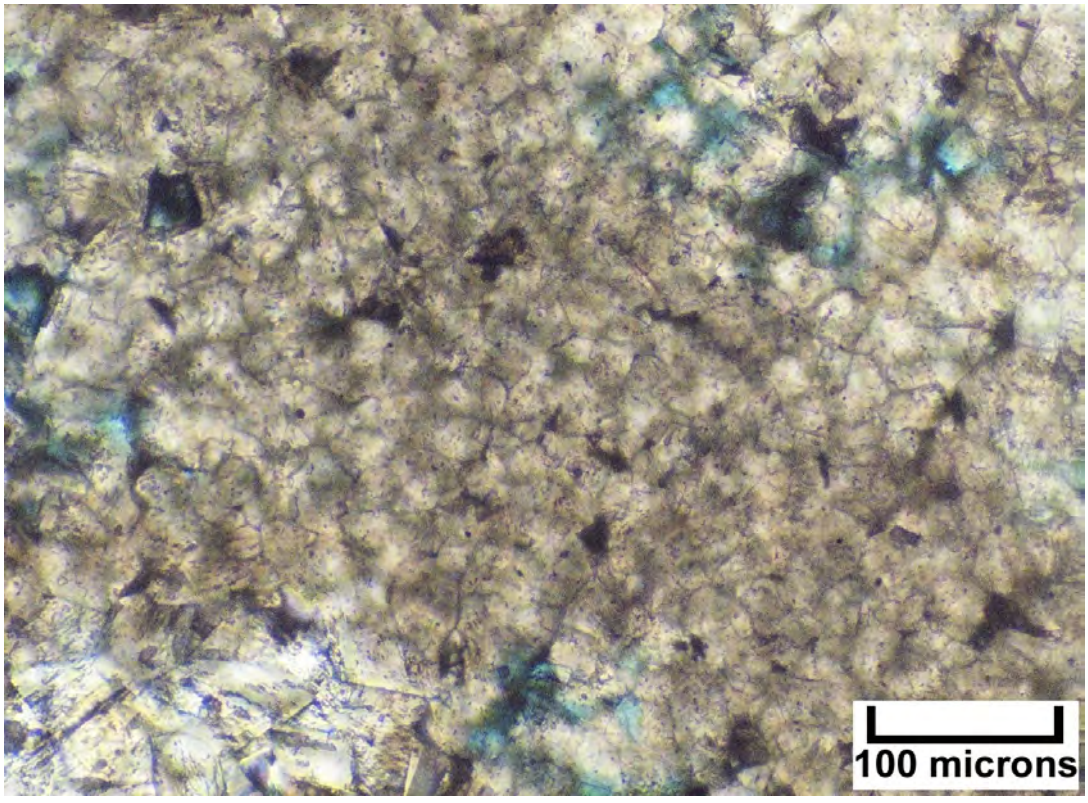
Top Photomicrograph

Epifluorescence in this image shows moderate yellow fluorescence in interlocking dolomitic mudstone composed of soft pellets throughout sample.

Bottom Photomicrograph

Same view under plane light as top photograph.


100 microns


100 microns

D-816 WELL,
LISBON FIELD

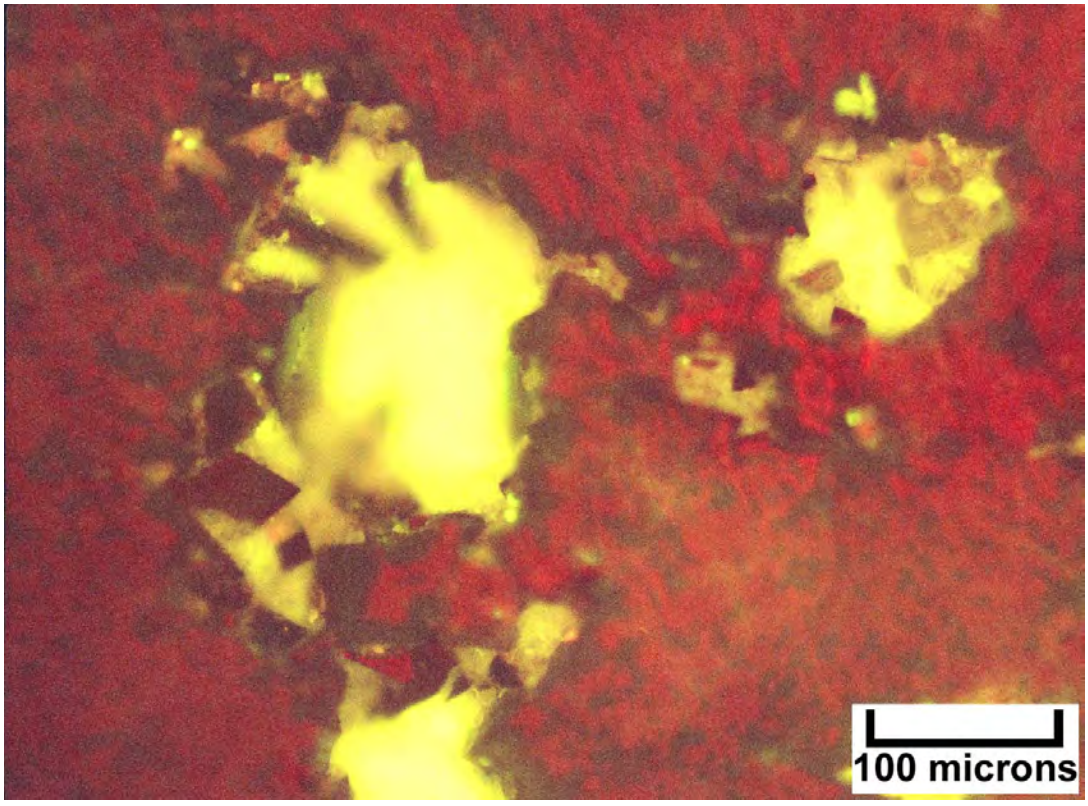
8421 feet

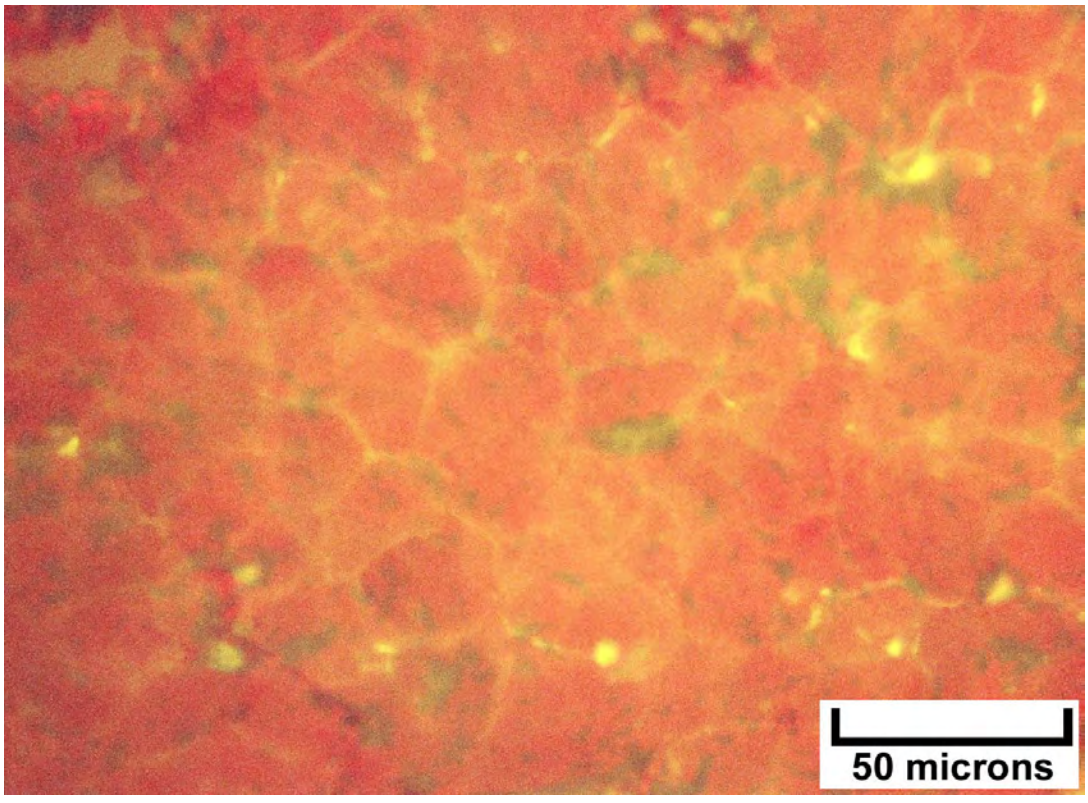
Top Photomicrograph

Epifluorescence in this field of view shows dull mineral fluorescence; no fluorescence due to organic material or oil within the matrix. Some pores (isolated molds) are lined with bright, yellow oil film fluorescence possibly from oil staining while others show no oil staining.

Bottom Photomicrograph

Epifluorescence in this field of view shows dull mineral fluorescence of tight, early matrix dolomitization with possible relict grains.


100 microns


50 microns

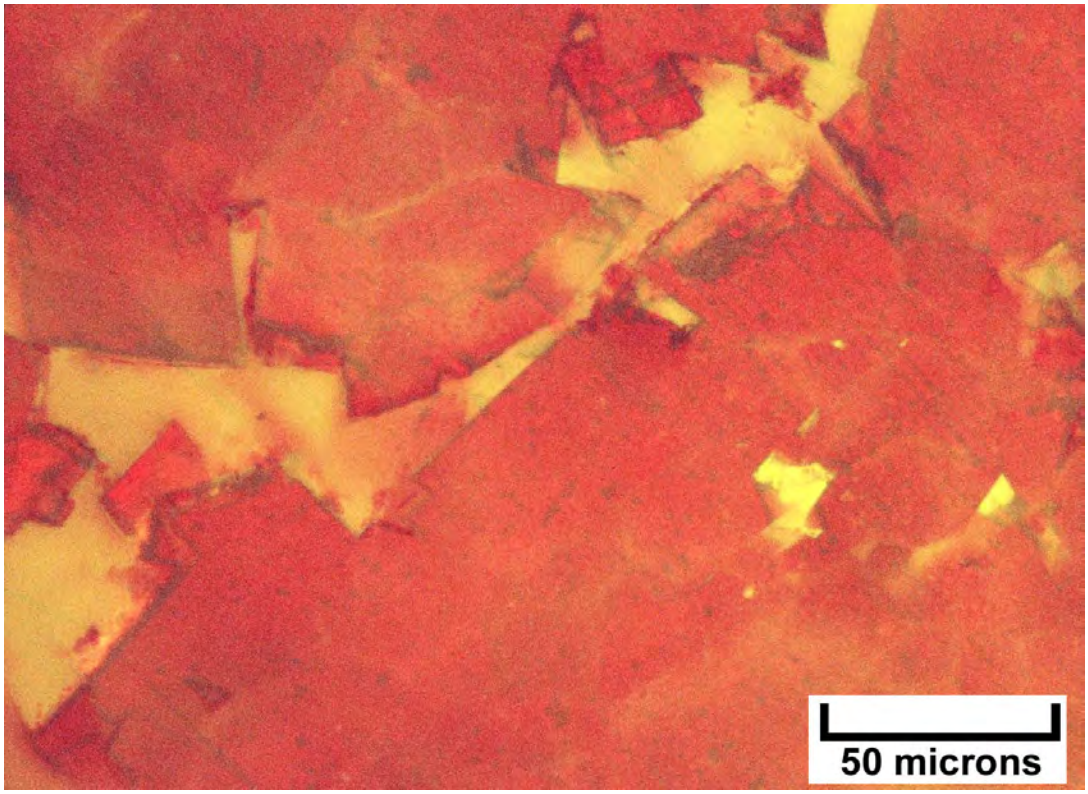
8421 feet

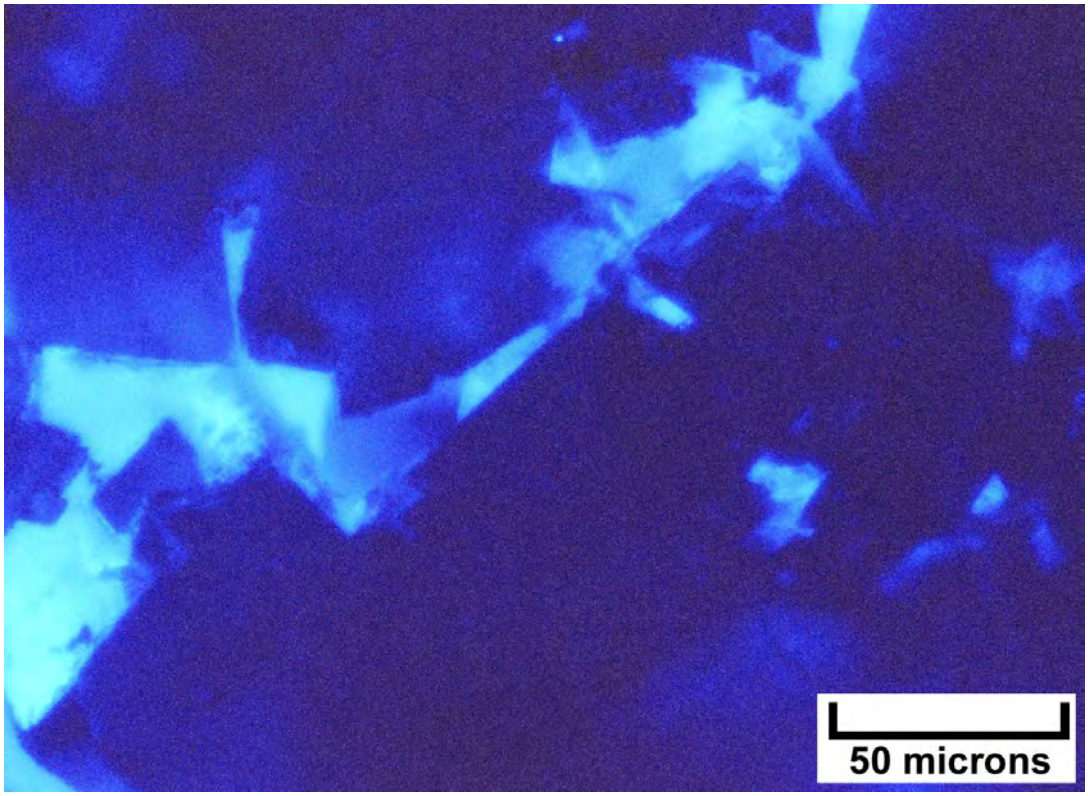
Top Photomicrograph

Epifluorescence in this field of view show a cluster of replacement saddle dolomite with dull mineral fluorescence. Note possible crystal zonation.

Bottom Photomicrograph

Same view under ultraviolet light as top photograph.

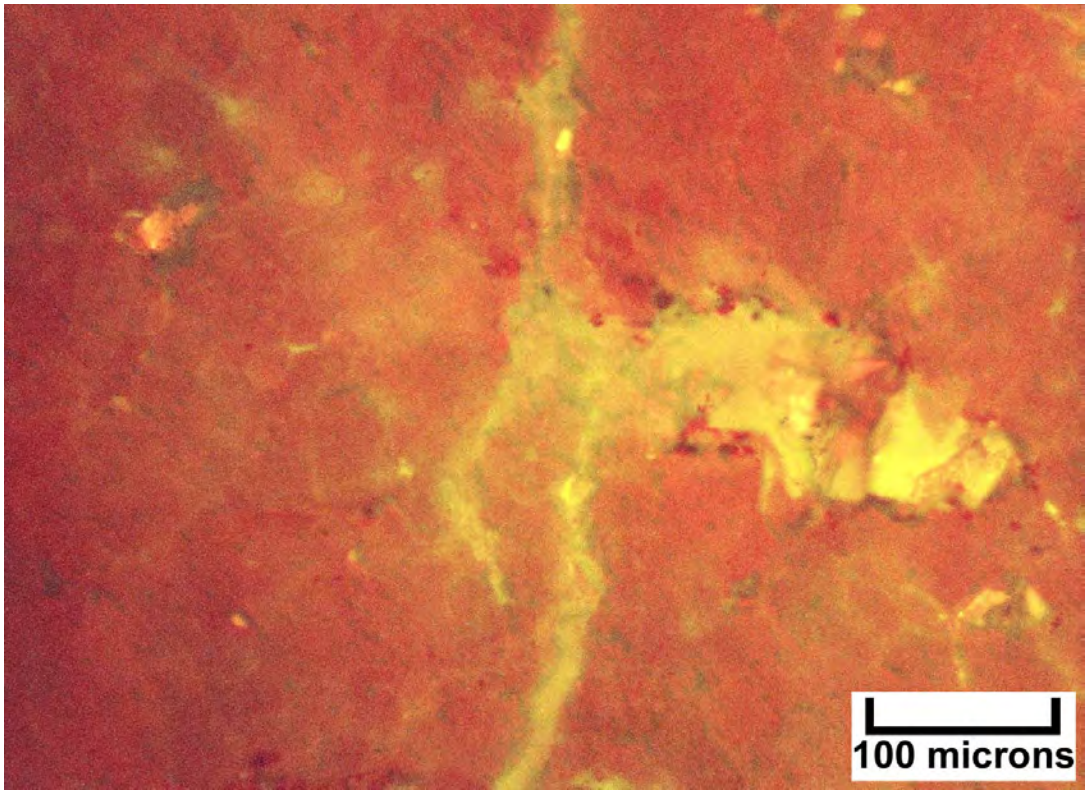

50 microns


50 microns

8421 feet

Top Photomicrograph

This EF image shows a microfracture cross-cutting a moldic pore within tight non-fluorescent dolomite. Note possible oil staining along the fracture.


100 microns

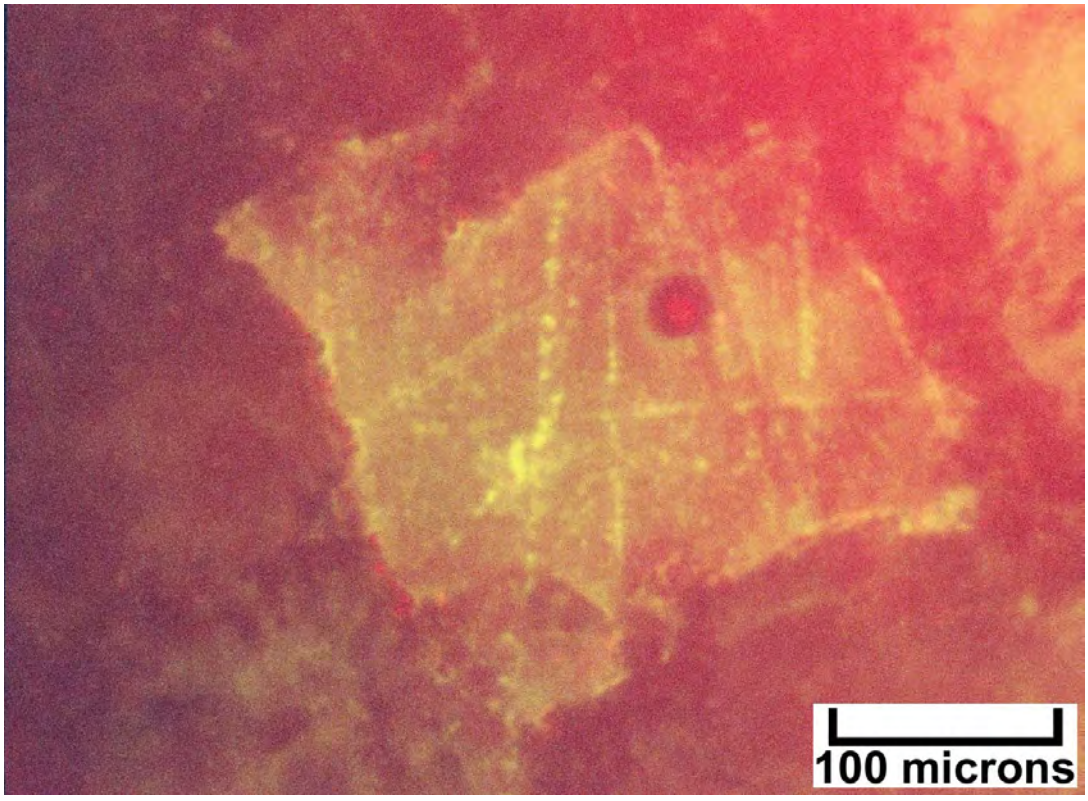
8423 feet

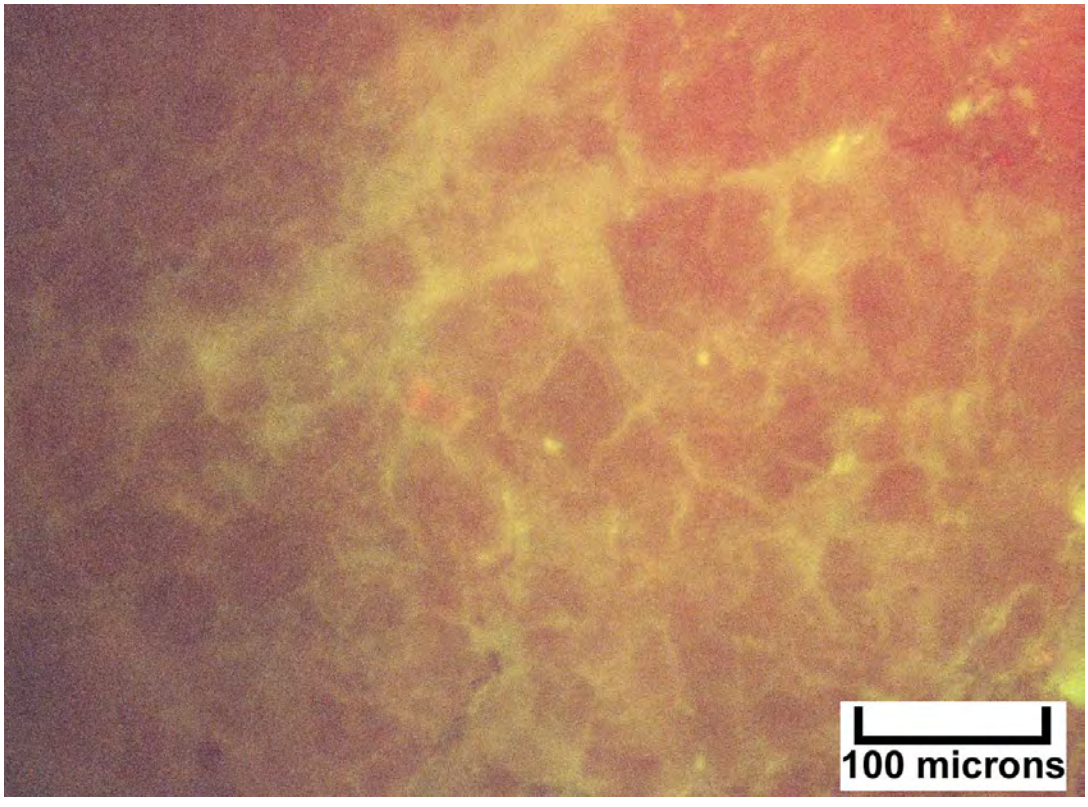
Top Photomicrograph

Epifluorescence shows a large blocky crystal aggregate that fluoresces brightly compared to surrounding black dolomite.

Bottom Photomicrograph

This EF image shows dully fluorescent early, tight dolomite being replaced by fluorescent late saddle dolomite.


100 microns


100 microns

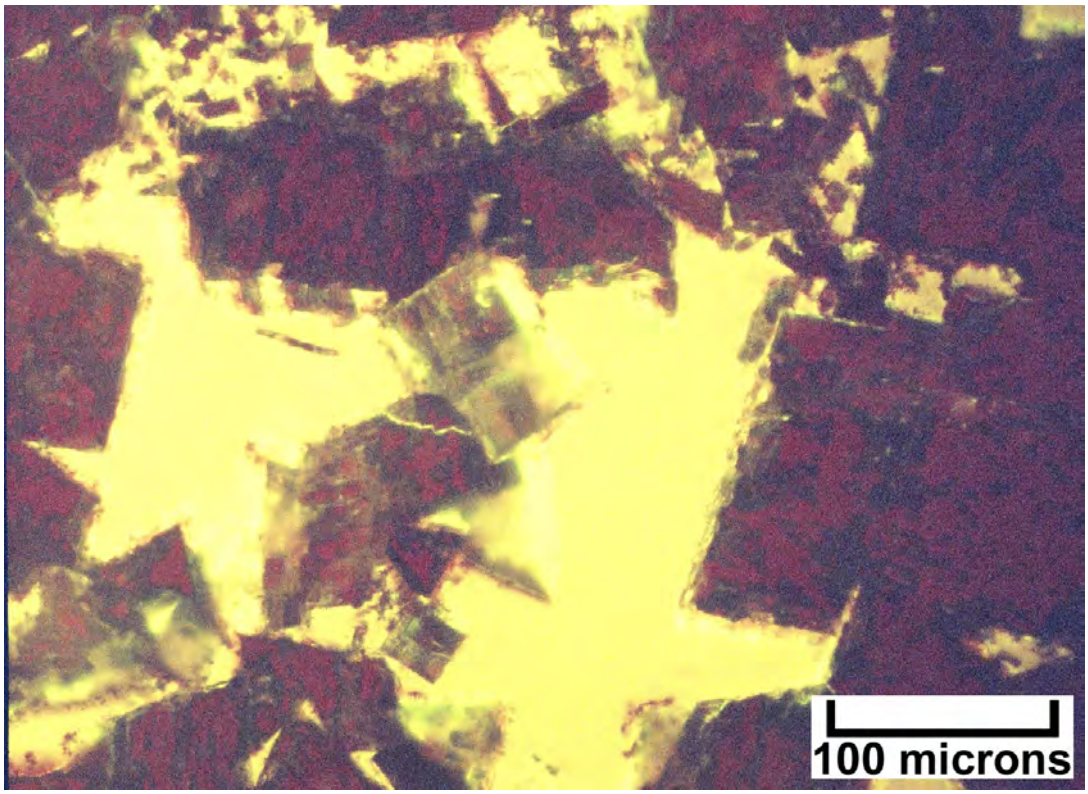
8433 feet

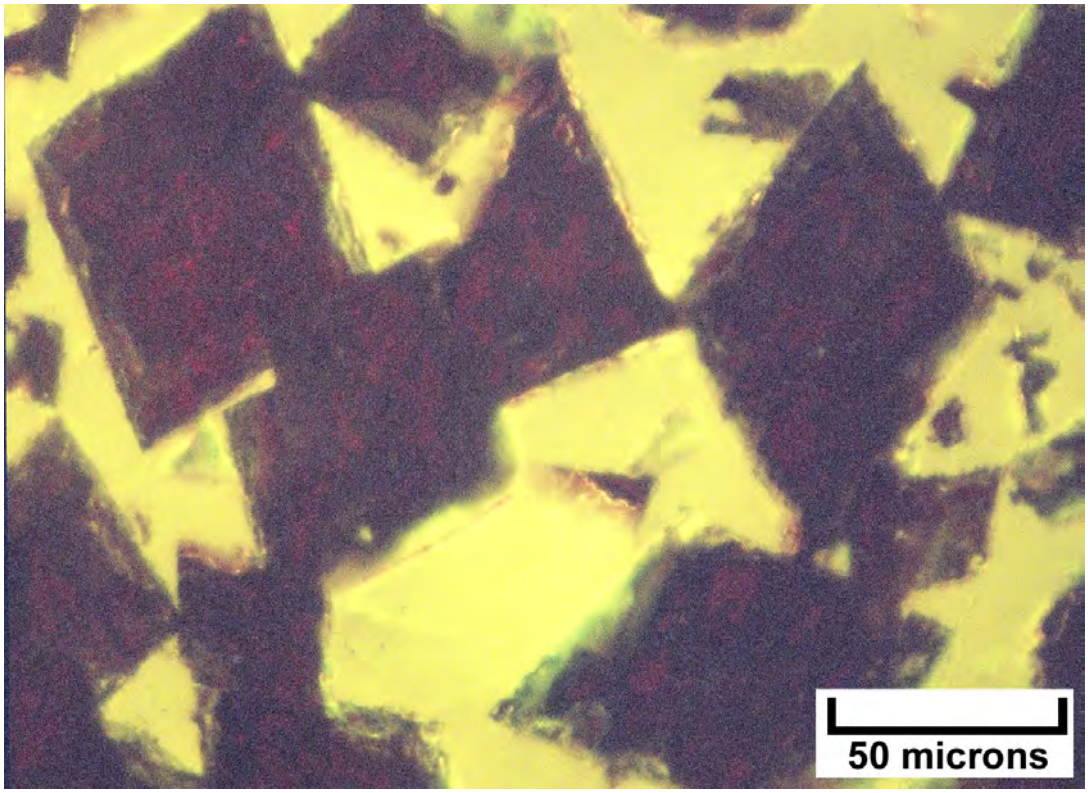
Top Photomicrograph

This EF image shows open pores with late fluorescent cement and several possible microsulfide rims in non-fluorescent dolomite replacement matrix.

Bottom Photomicrograph

This EF image shows planar rhombic dolomite, excellent intercrystalline porosity, and some highly fluorescent yellow dolomite with possible oil inclusions.


100 microns


50 microns

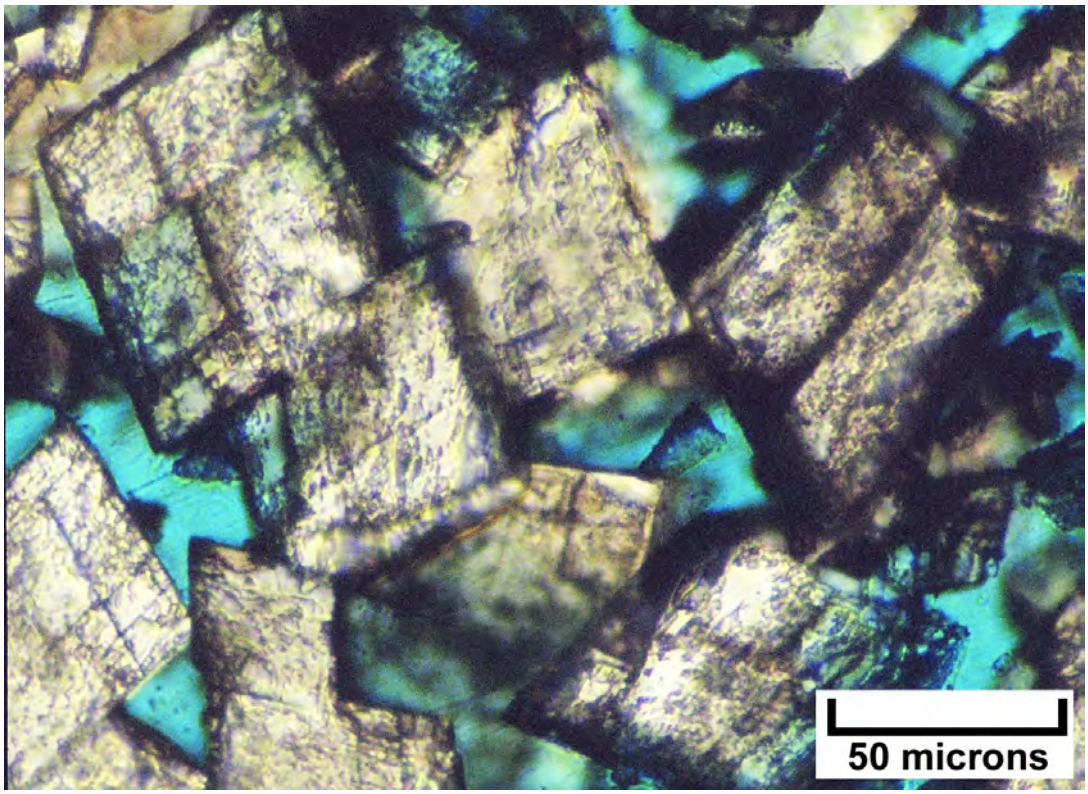
8433 feet

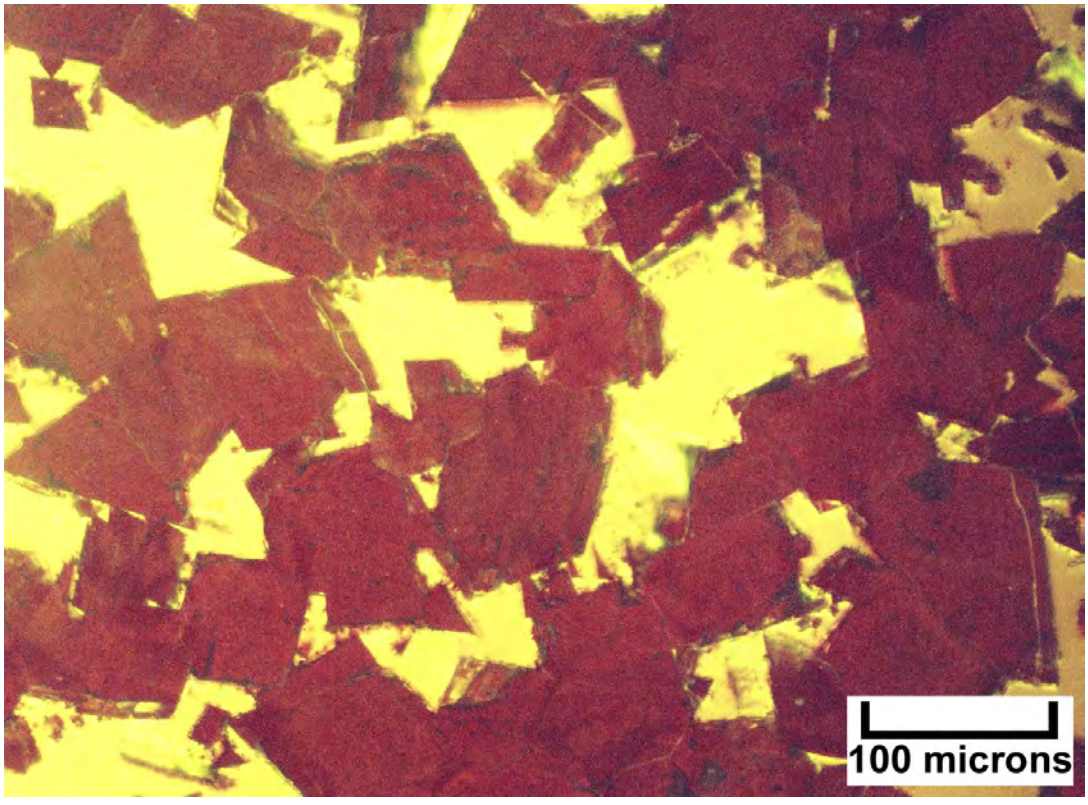
Top Photomicrograph

Same view under plane light as bottom photomicrograph on previous page.

Bottom Photomicrograph

Epifluorescence shows interconnected intercrystalline porosity within saddle dolomite.

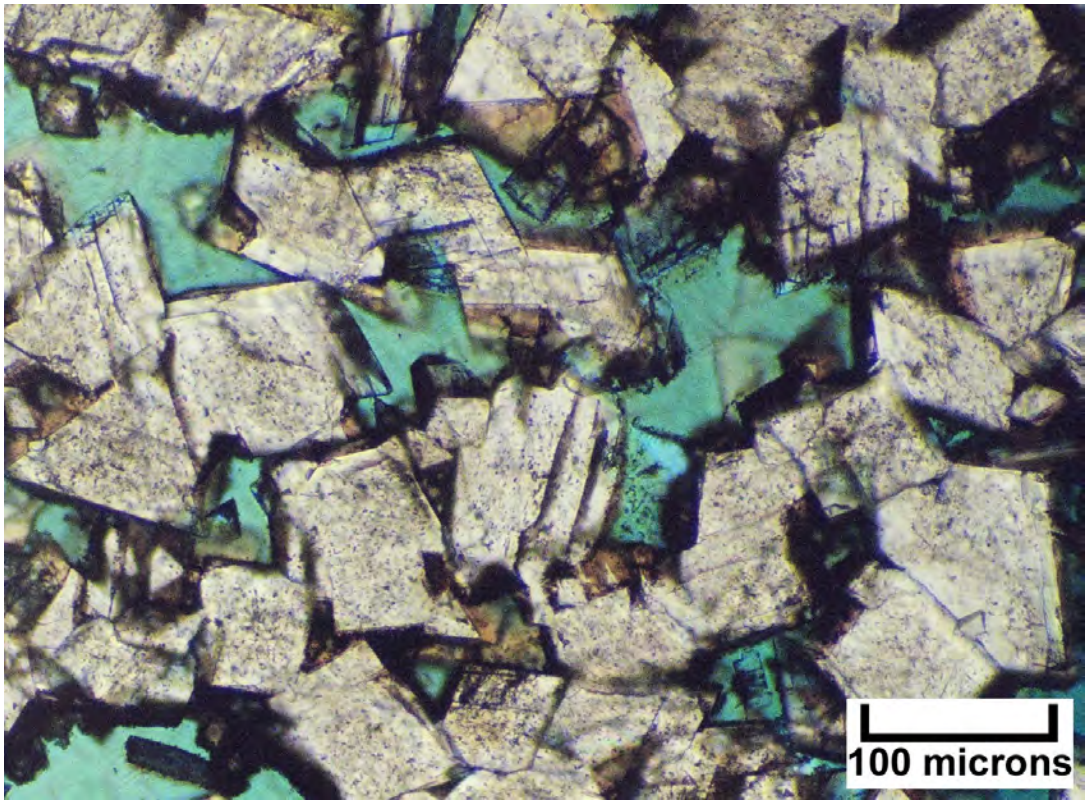

50 microns


100 microns

8433 feet

Top Photomicrograph

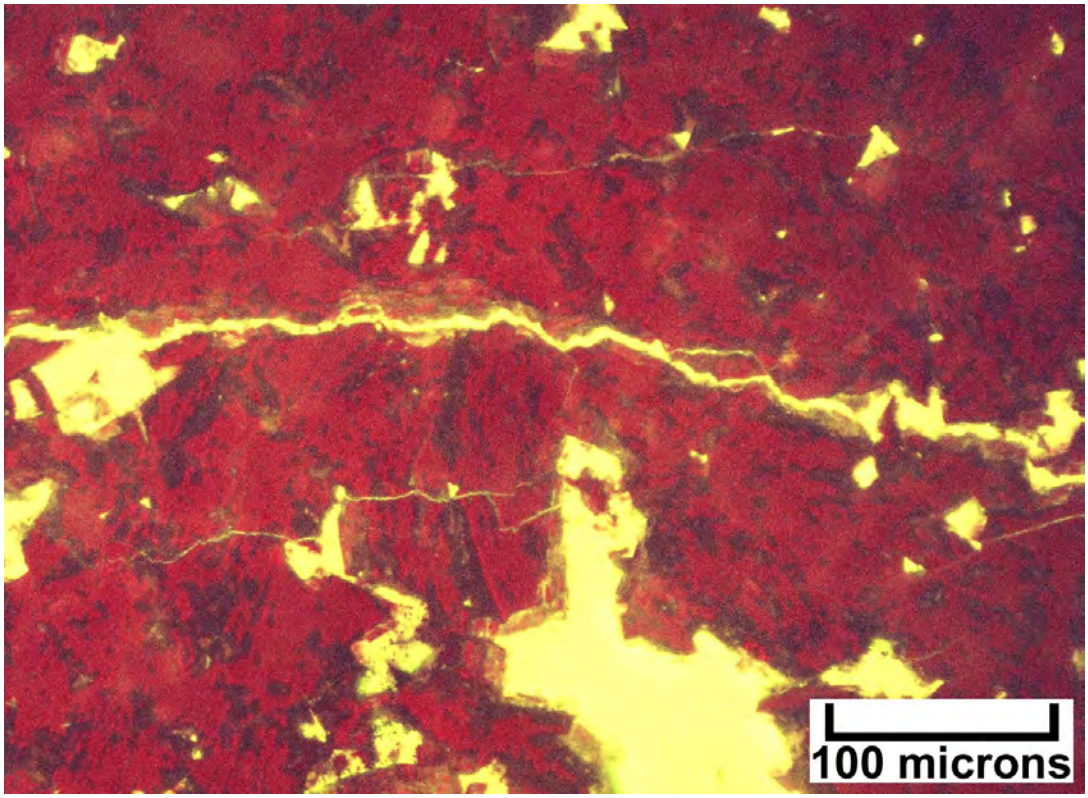
Same view under plane light as bottom photomicrograph on previous page.


100 microns

8442 feet

Top Photomicrograph

Epifluorescence shows an open microfracture, possible dissolution of dolomite rhombs along the fracture.


100 microns

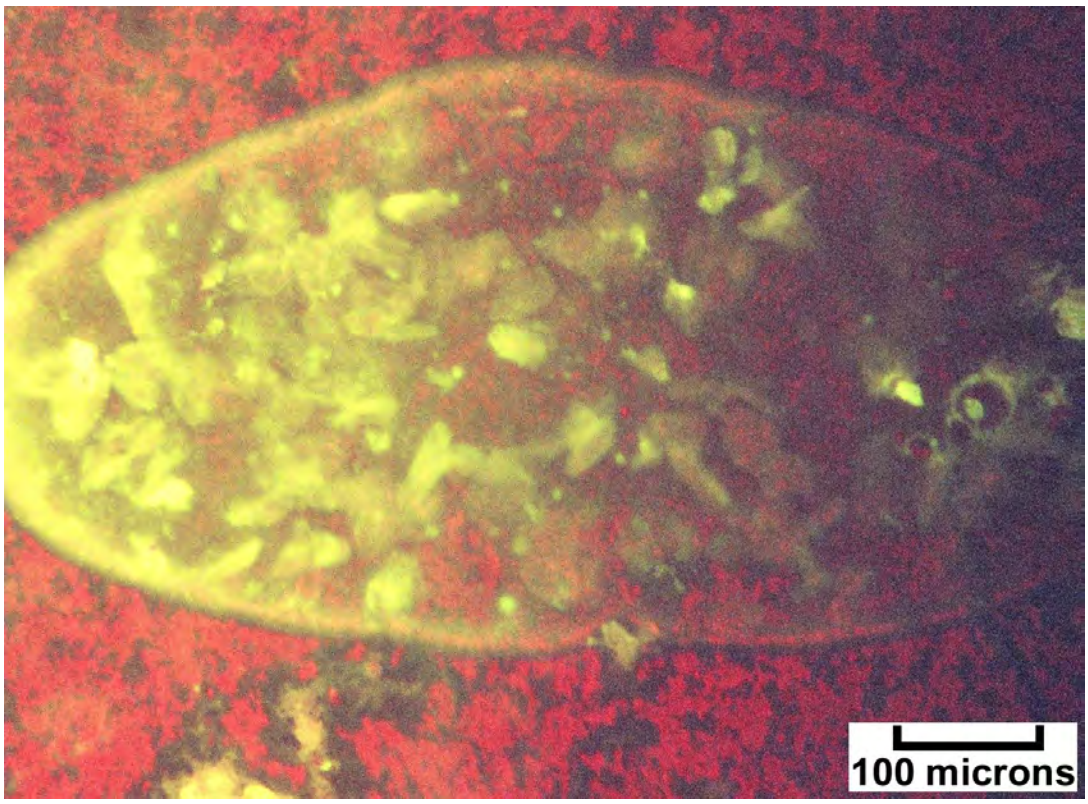
8444 feet

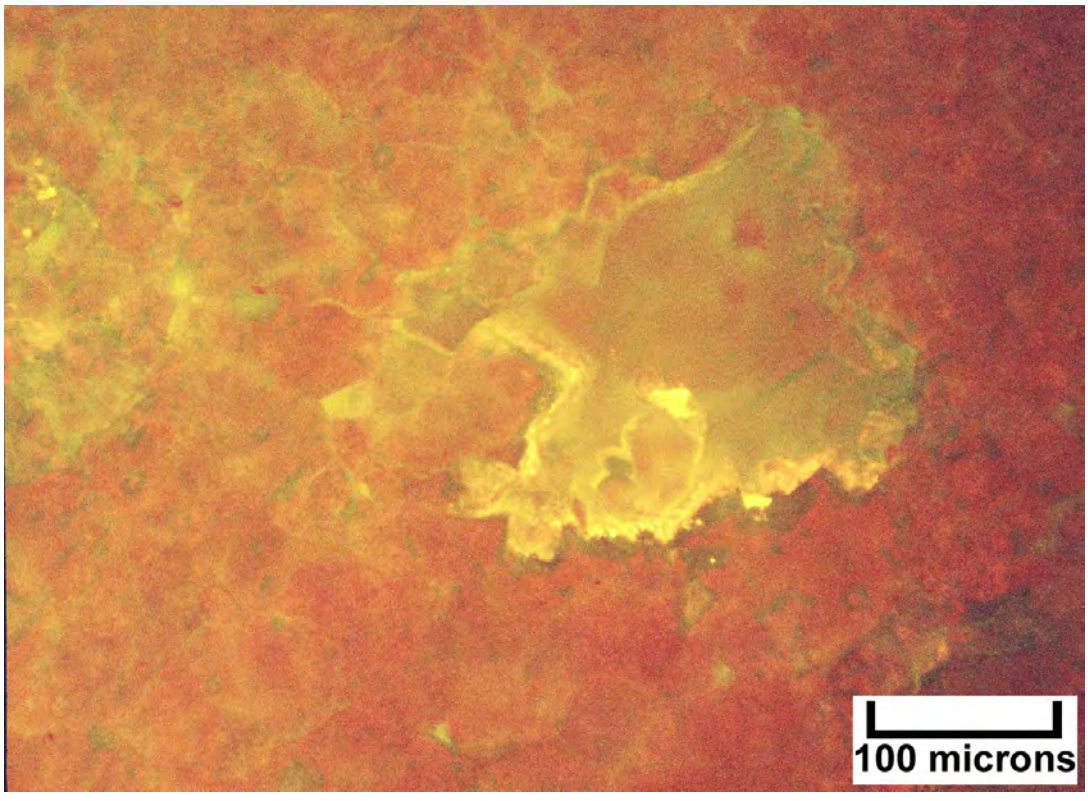
Top Photomicrograph

Epifluorescence indicates most dolomite is early syngenetic. This view shows dull yellow fluorescence of early dolomite, probably from original organic matter, within a shell.

Bottom Photomicrograph

Epifluorescence shows small mold containing some slightly fluorescent dolomite cement.

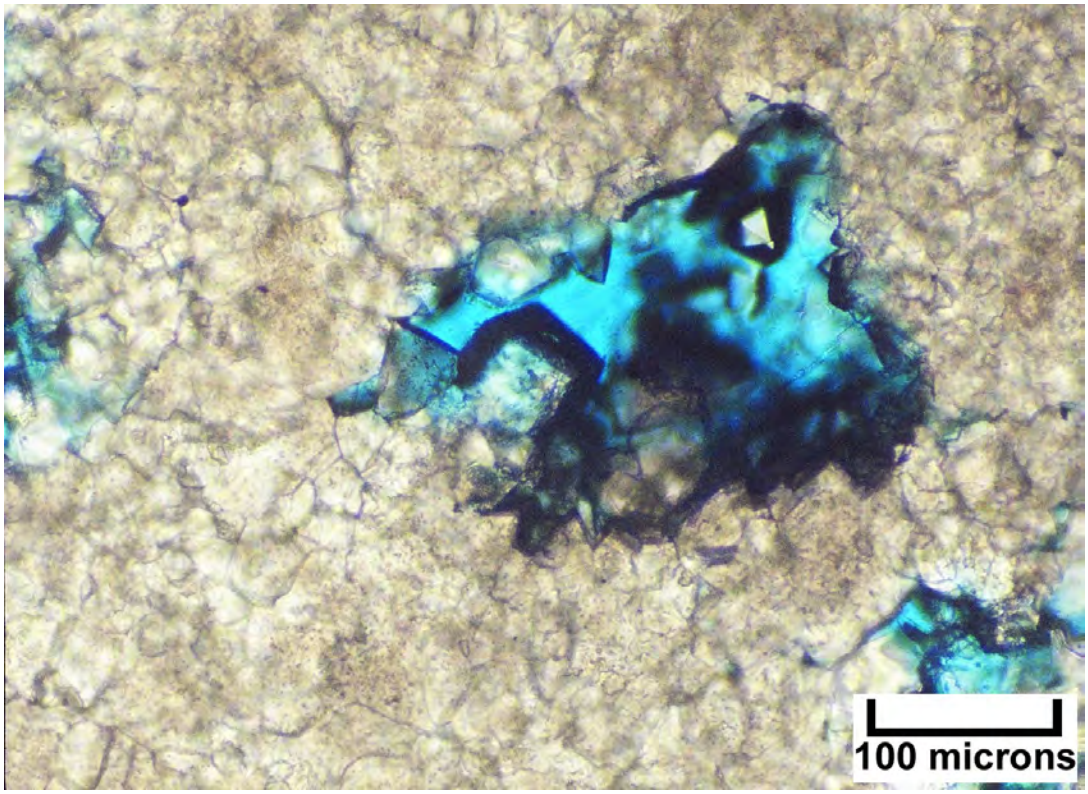

100 microns


100 microns

8444 feet

Top Photomicrograph

Same view under plane light as bottom photomicrograph on previous page.


100 microns

B-816 WELL,
LISBON FIELD

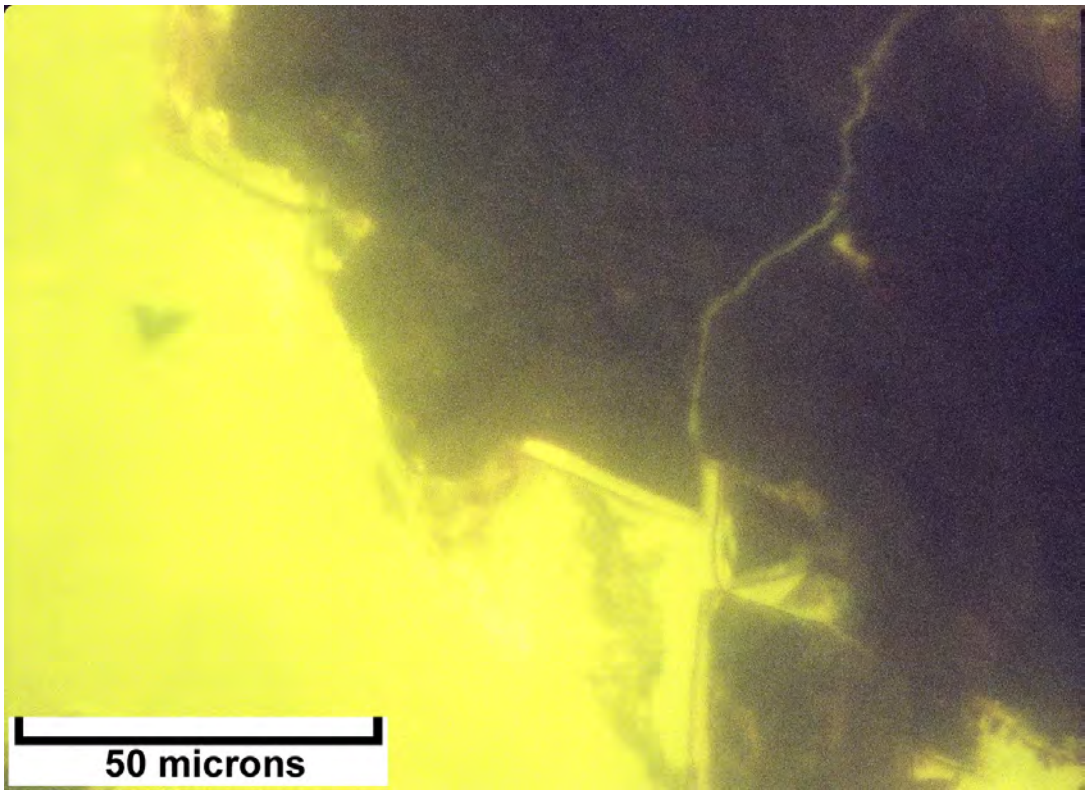
8486 feet

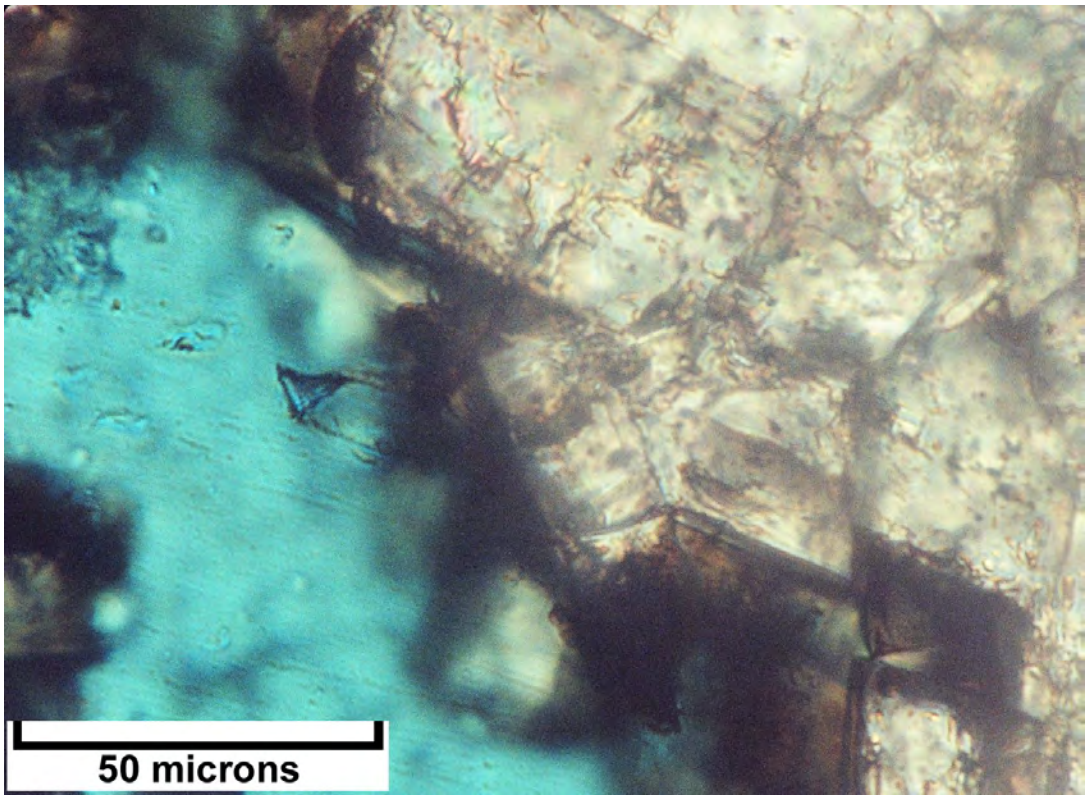
Top Photomicrograph

Epifluorescence shows replacement dolomite has highly yellow fluorescent rims; the saddle dolomite cement has moderate yellow-green fluorescence; late calcite cements are generally non-fluorescent.

Bottom Photomicrograph

Same under plane light as top photomicrograph.


50 microns


50 microns

THIN SECTION CATHODOLUMINESCENCE AND DESCRIPTIONS

D-616 WELL, LISBON FIELD

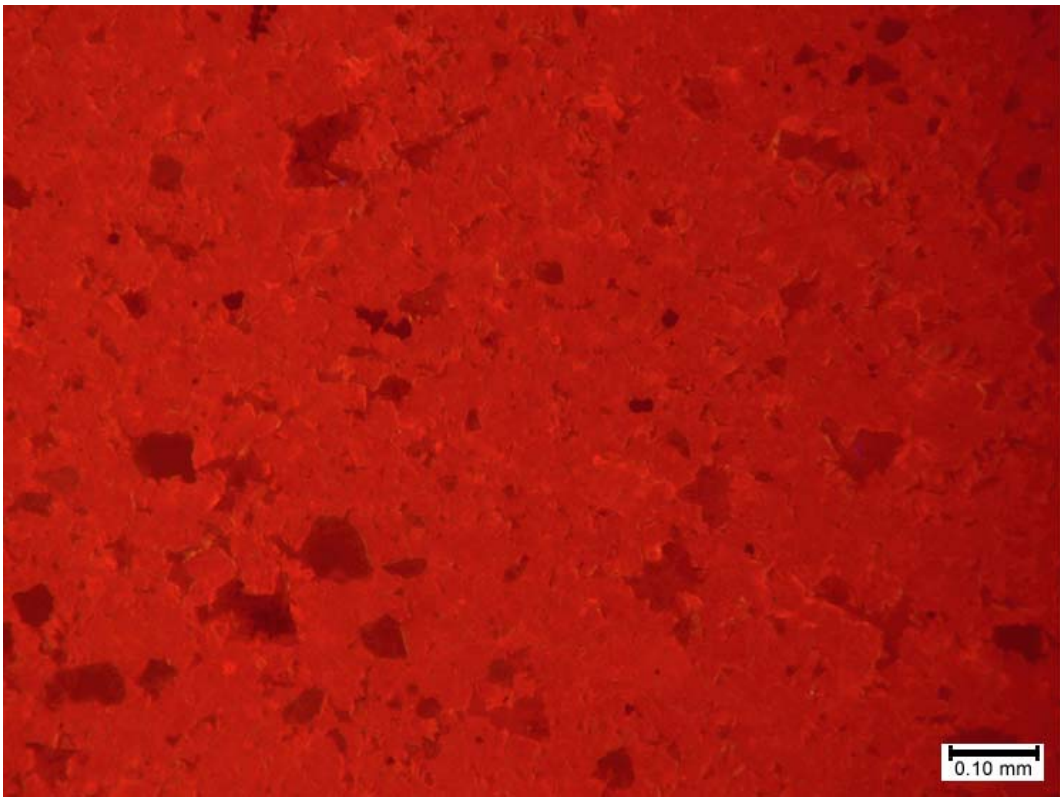
8308-09 feet

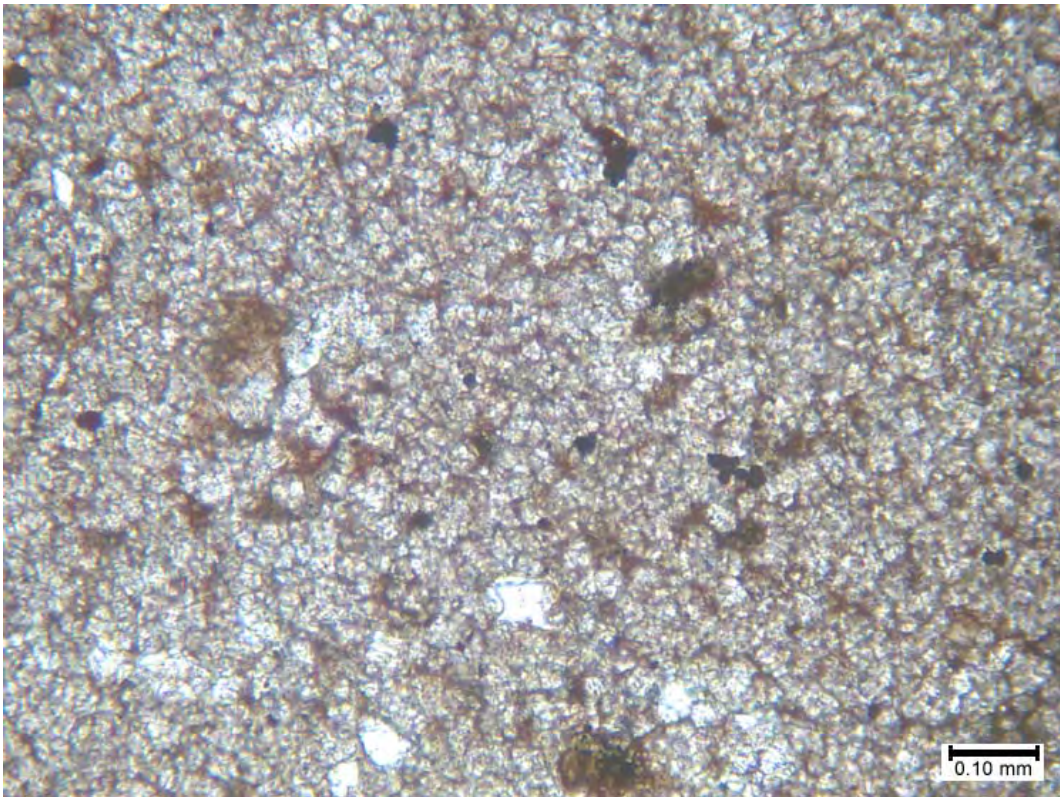
Top Photomicrograph

This area of replacement dolomite occurs within a narrow, vertical crack filled with sediment which cross cuts a tight limestone in which marine carbonate grains are readily visible. This field of view is entirely within the crack filling. Note the generally ubiquitous red luminescence of the finely crystalline dolomites. Hints of the original grain outlines can be seen , especially across the central portion (from left to right) of this image. Most of these grains appear to have been hard peloids. The dark (non-luminescent) patches and portions of this micrograph are mostly detrital quartz and feldspar grains or lithified carbonate clasts (see the next two photographs under plane and cross-polarized lighting). The small polygonal black (opaque) crystals scattered throughout this view are sulfide minerals.

Bottom Photomicrograph

The same field of view as the previous photomicrograph is shown here under plane light. Note the anhedral, interlocking character of the replacement dolomite crystals across this field of view. These dolomites appear to replace peloids and other carbonate debris within the filled (karst) crack. The white areas are detrital siliciclastic grains and the brownish areas are clay-rich grains and cements, Finally, the black (opaque) areas are sulfide minerals. Note that there is no visible porosity within this dolomite.

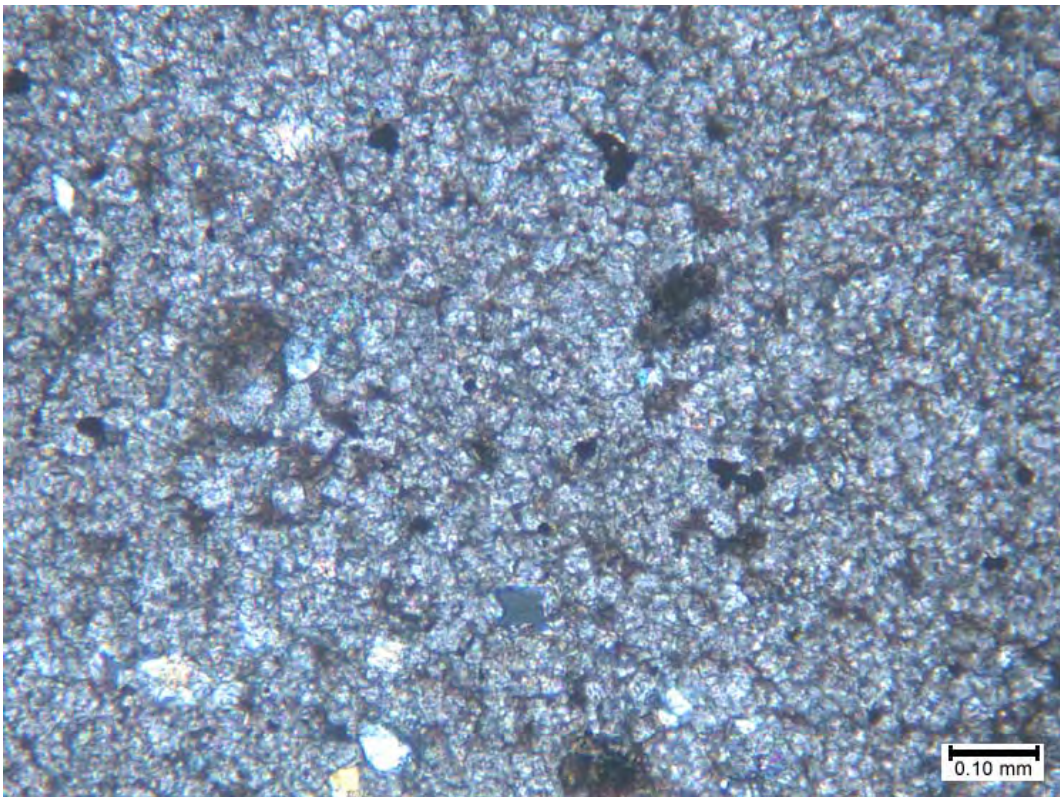

0.10 mm


0.10 mm

8308-09 feet

Top Photomicrograph

The same field of view as the previous two photomicrographs is shown here under crossed nicols. The poorly sorted, interlocking replacement dolomites display very small subcrystals without any distinctive shape or form. The siliciclastic grains (mostly quartz and feldspar) display first order colors in the range of orange, to light yellow to medium gray in this view. The amorphous brownish areas are mostly clay minerals.


0.10 mm

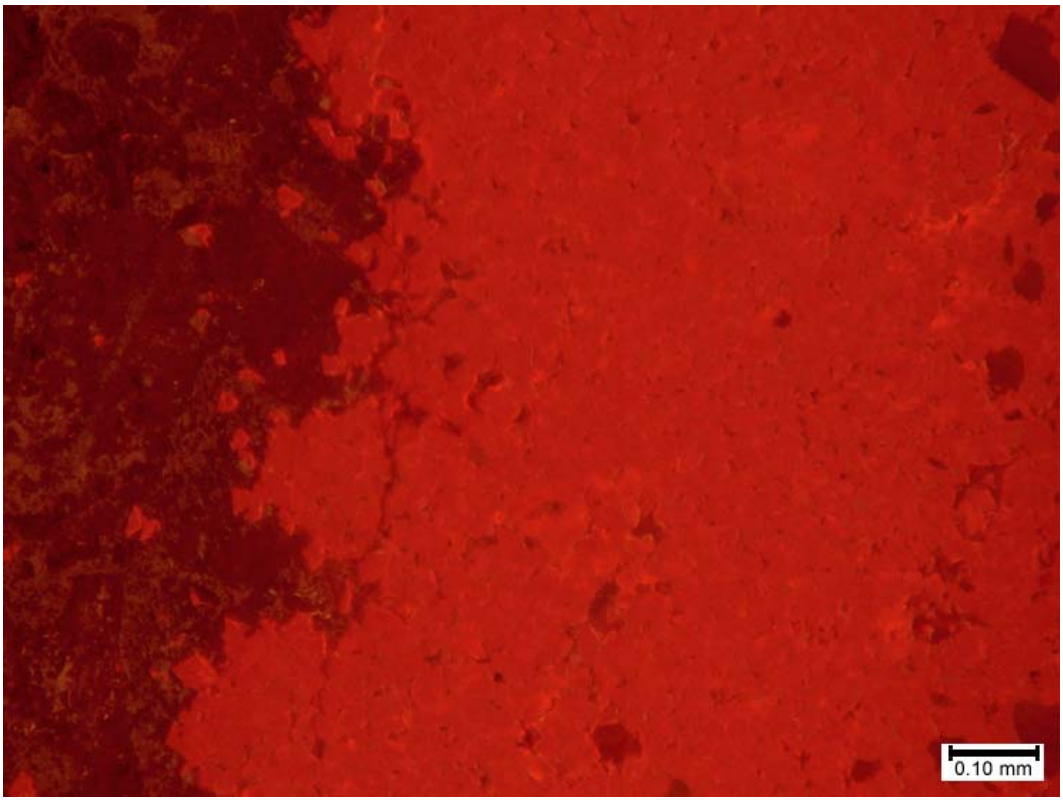
8308-09 feet

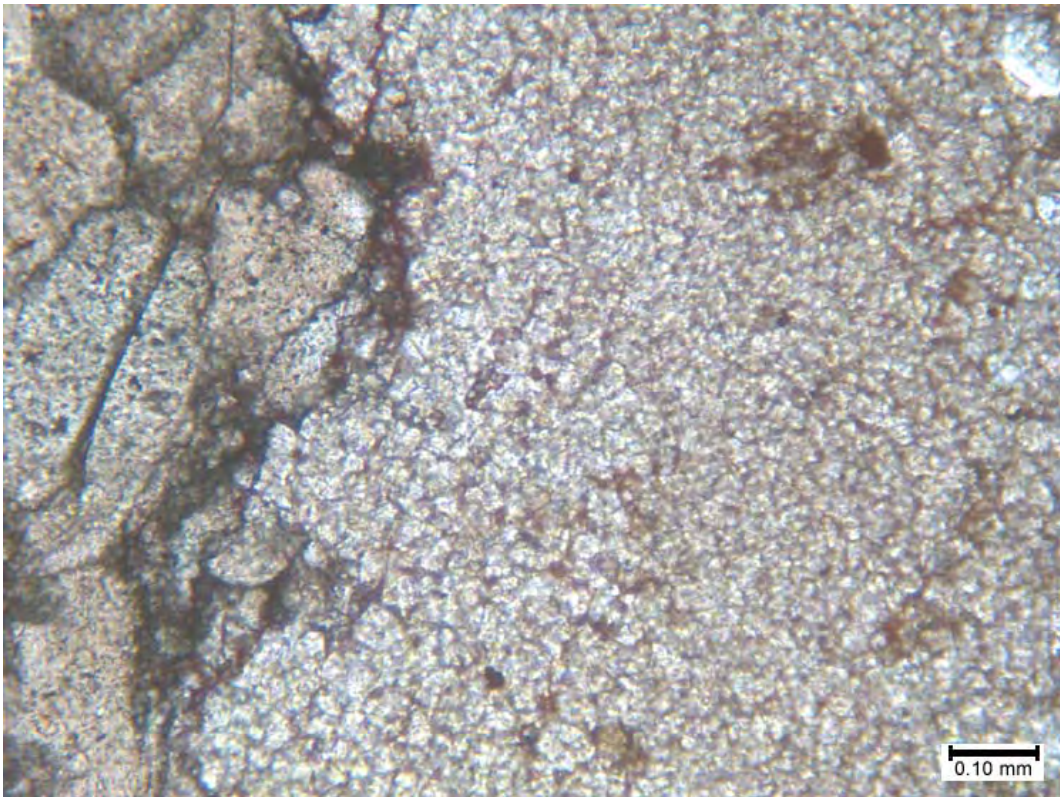
Top Photomicrograph

This image shows another view of the contact separating the dolomitized sediment fill within a vertical karst cavity and the well-cemented fossiliferous limestone that hosts this filled cavity. A few small dolomite replacement rhombs are present as the red crystals within the limestone field to the left. The black ("dead") patches within the limestone field are mostly fossils, including crinoids, that are surrounded by dull, orangish calcite (syntaxial) cements. The dolomite field displays fairly uniform red luminescence except for the "dead" siliciclastic grains.

Bottom Photomicrograph

The same field of view as the previous photomicrograph is shown here under plane light. Note the tight, interlocking character of the dolomite field, with occasional brownish patches of clay minerals. The fossiliferous limestone field to the left displays numerous microfractures that are not as apparent in the dolomite field. There is no visible porosity within either the dolomite or the limestone field.

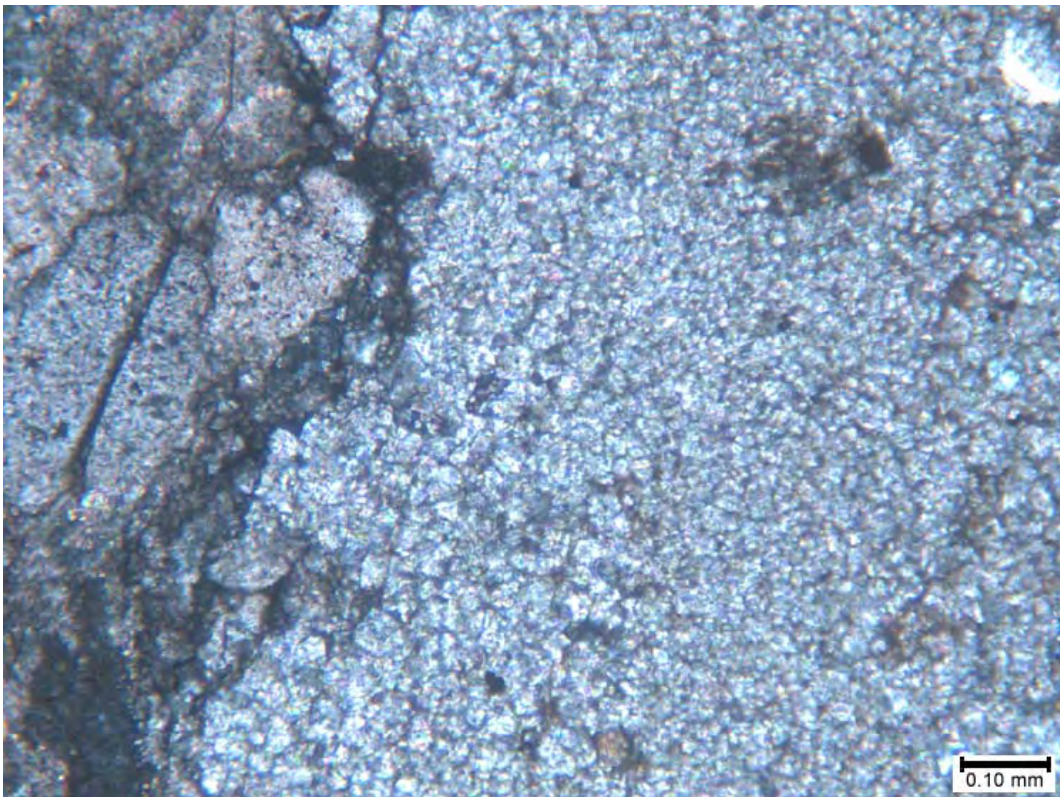

0.10 mm


0.10 mm

8308-09 feet

Top Photomicrograph

The same field of view as the previous two photomicrographs is shown here under crossed nicols. This lighting makes it easier to distinguish the fossil grains, especially the crinoid ossicles, in the lefthand limestone field. The microfractures crossing the fossils and cements are also very easy to distinguish. Note the anhedral habit of the dolomitized karst filling to the right. These dolomites are composed of small subcrystals with variable extinction positions.


0.10 mm

D-816 WELL,
LISBON FIELD

8433 feet

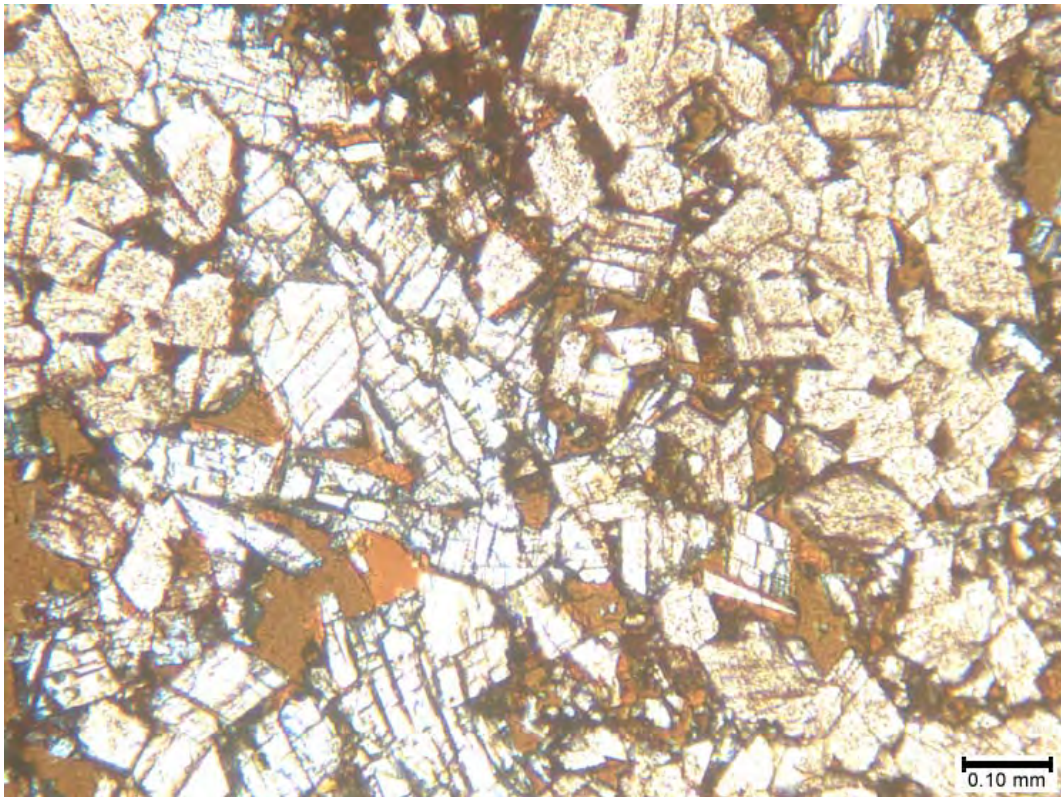
Top Photomicrograph

Two types of cathodoluminescence response are visible within these moderately coarse dolomite crystals. Bright red luminescence can be seen within the interiors of most of the replacement dolomite. However, many of the crystals exhibit non-luminescent overgrowths of variable thickness. In addition, some crystals, especially from the band of material between the upper left and the lower center, exhibit mostly non-luminescent material. These particular crystals may be largely dolomite cements. Finally, some dolomite crystals exhibit a thin rind of red luminescing dolomite overlying the non-luminescent overgrowth stage. Dissolution and corrosion of some crystals is evident between the second (non-luminescent) and the final luminescent rim (see the "healed" large zoned crystal in the left center of this image.)

Bottom Photomicrograph

The same field of view as the previous photomicrograph is shown here under plane light. Note the generally coarse nature of these subhedral to euhedral dolomite crystals. The copper-colored areas in this view are open pores (with impregnated epoxy that has been discolored by the electron beam used for cathdoluminescence). The black areas within this field of view are due to black pyrobitumen coatings on many of the dolomite crystal surfaces.


0.10 mm


0.10 mm

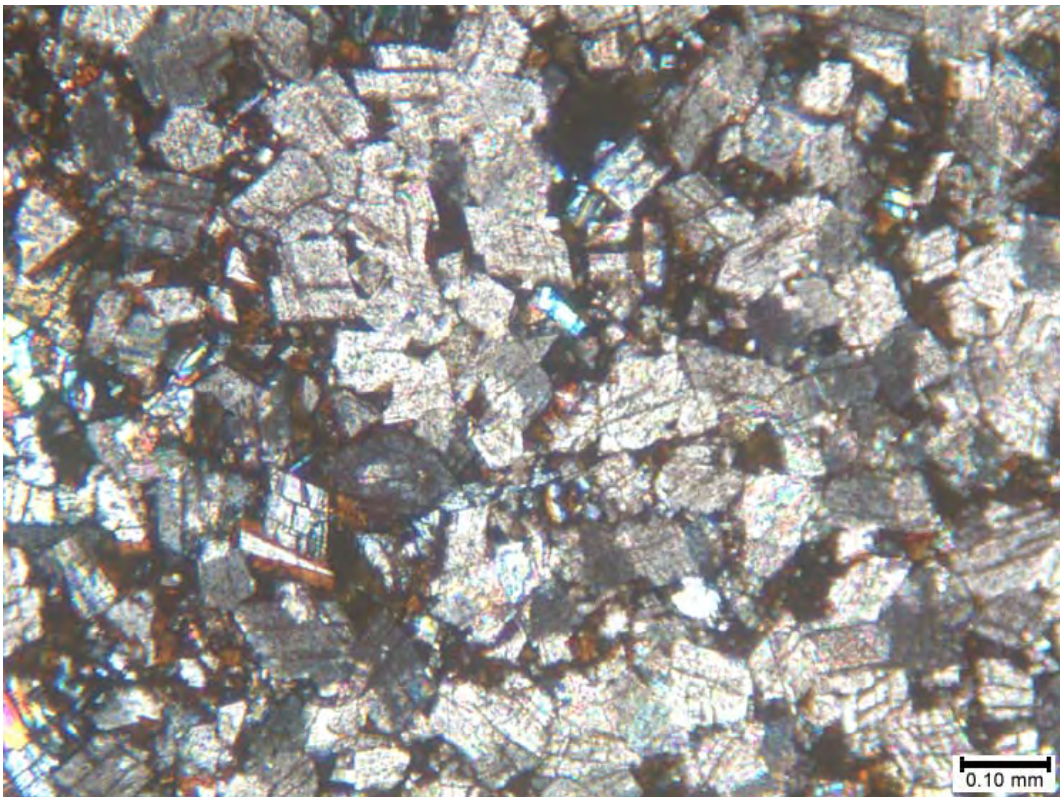
8433 feet

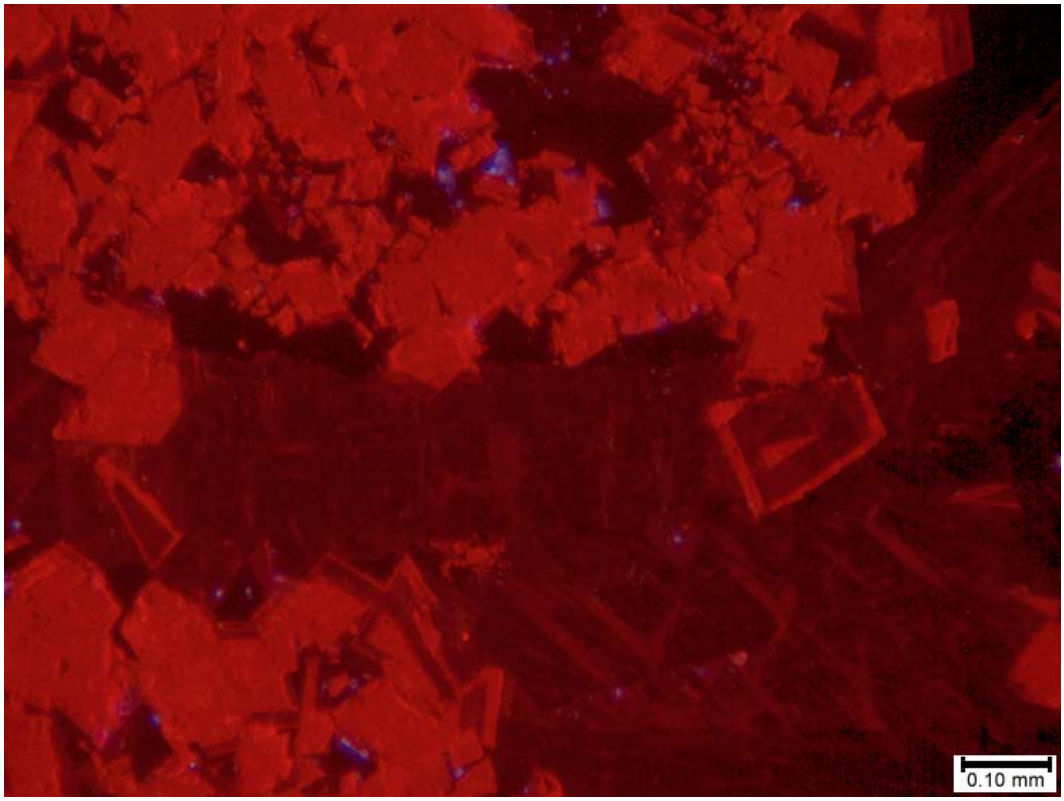
Top Photomicrograph

The same field of view as the previous two photomicrographs is shown here under crossed nicols. This lighting makes it easier to distinguish the crystal habit of both the replacement and pore-filling dolomites. Note that many of the dolomite crystals display undulose extinction while others have composite (more than one) extinction positions within single crystal outlines. In addition, some of the crystals exhibit curved crystal faces.

Bottom Photomicrograph

This cathodoluminescence image is from another portion of the same samples as the previous set of three micrographs. Note the strong luminescence zonation of some of the dolomite crystals. Many of the crystals exhibit bright red luminescing crystal cores with non-luminescent overgrowths of variable thickness. A final, thin rim of bright red luminescing dolomite overgrowth completes some crystals. In addition, some crystals, especially from the band of material across the base of the micrograph, exhibit mostly non-luminescent material. These particular crystals may be largely dolomite cements. Finally, some dolomite crystals exhibit a thin rind of red luminescing dolomite overlying the non-luminescent overgrowth stage. Dissolution and corrosion of some crystals are evident by the ragged margins of some of the first generation, bright red luminescing dolomite crystals.


0.10 mm


0.10 mm

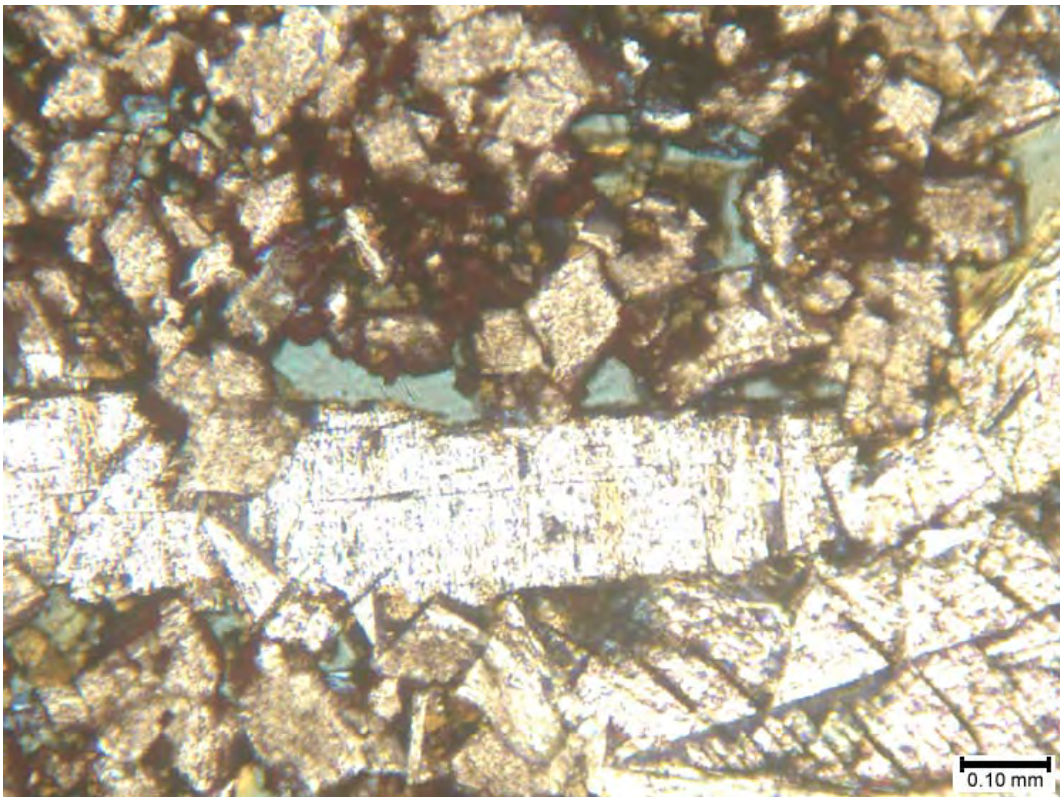
8433 feet

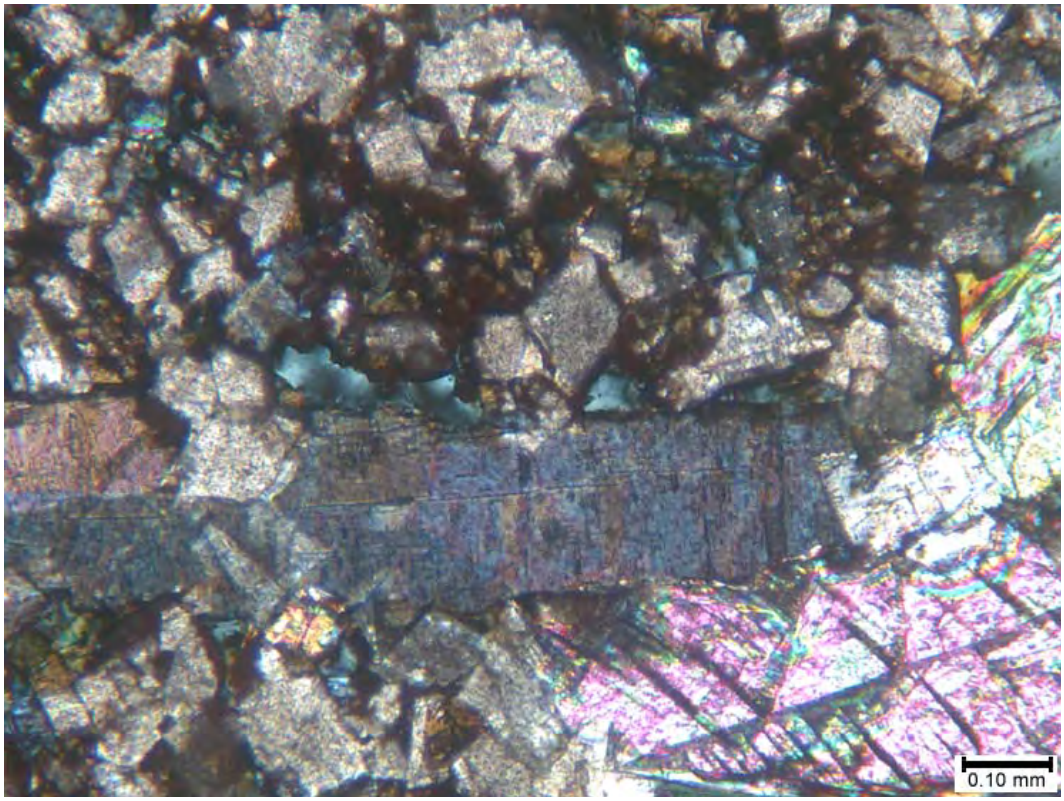
Top Photomicrograph

The same field of view as the previous photomicrograph is shown here under plane light. Note the wide range of crystal sizes of these rhombic dolomite crystals across the upper half of this image. These dolomites appear medium gray in part because of their cloudy or inclusion-rich nature. The lower half is dominated by much clearer (white) dolomites with a chain-like habit of tabular crystals. This dolomite appears to be a fracture-filling cement. The black areas within this field of view are due to black pyrobitumen coatings on many of the dolomite crystal surfaces. The blues areas between many of the replacement dolomite crystals are open pores.

Bottom Photomicrograph

The same field of view as the previous two photomicrographs is shown here under crossed nicols. This lighting makes it easier to distinguish the crystal habits and birefringence differences between the dominantly matrix replacement dolomites across the top of the images and the large tabular dolomites across the lower portion of the micrograph. Note the apparent undulose extinction of many of the replacement dolomite rhombs.


0.10 mm


0.10 mm

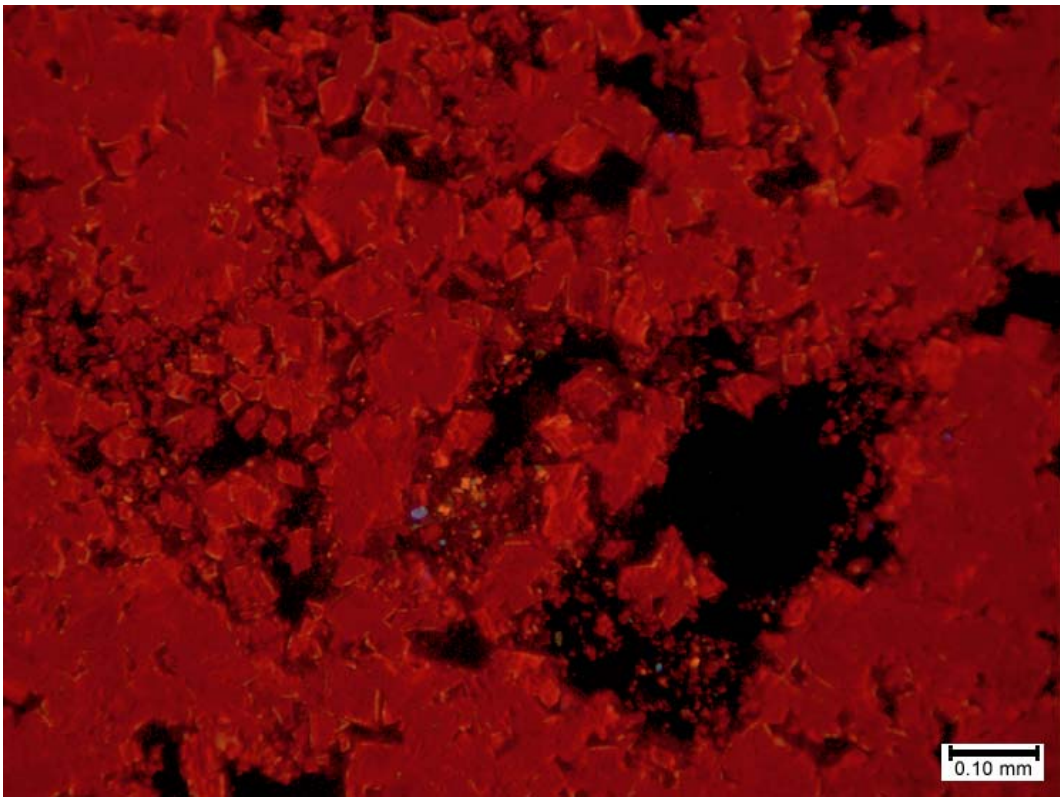
8442-43 feet

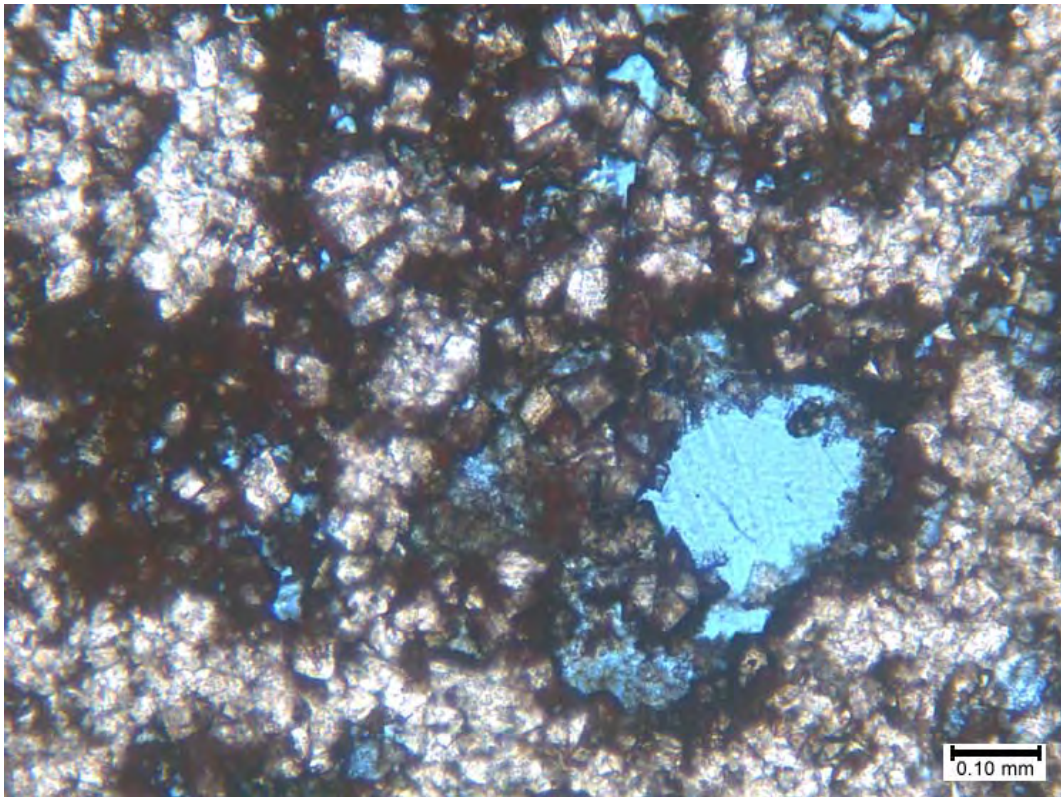
Top Photomicrograph

Cathodoluminescence shows a wide range of crystal size and growth habits within the dull red luminescing, matrix-replacing dolomite. Some of the coarser dolomite crystals appear to have an overgrowth of brighter red luminescent material. The range in dolomite rhomb sizes may reflect rapidity of precipitation. The blue and green luminescing silt-sized grains in the lower center portion of the image are probably detrital quartz and feldspar silt grains. The black areas are open pores. The amount of open porosity in this view is considerably greater than that visible under plane light microscopy (see the next micrograph of this same field of view).

Bottom Photomicrograph

The same field of view as the previous photomicrograph is shown here under plane light. The outlines of the dolomite crystals are not nearly as distinct and crisp here as in the previous CL view. Note the very cloud nature of these matrix dolomites. The zoned nature of these dolomites cannot be seen without CL examination. The black areas in this image are due to pyrobitumen linings on the dolomite crystal faces. The blue areas are open pores. Most of these pores are intercrystalline (BC) types except for the rounded moldic (MO) pore in the lower right portion of this image.

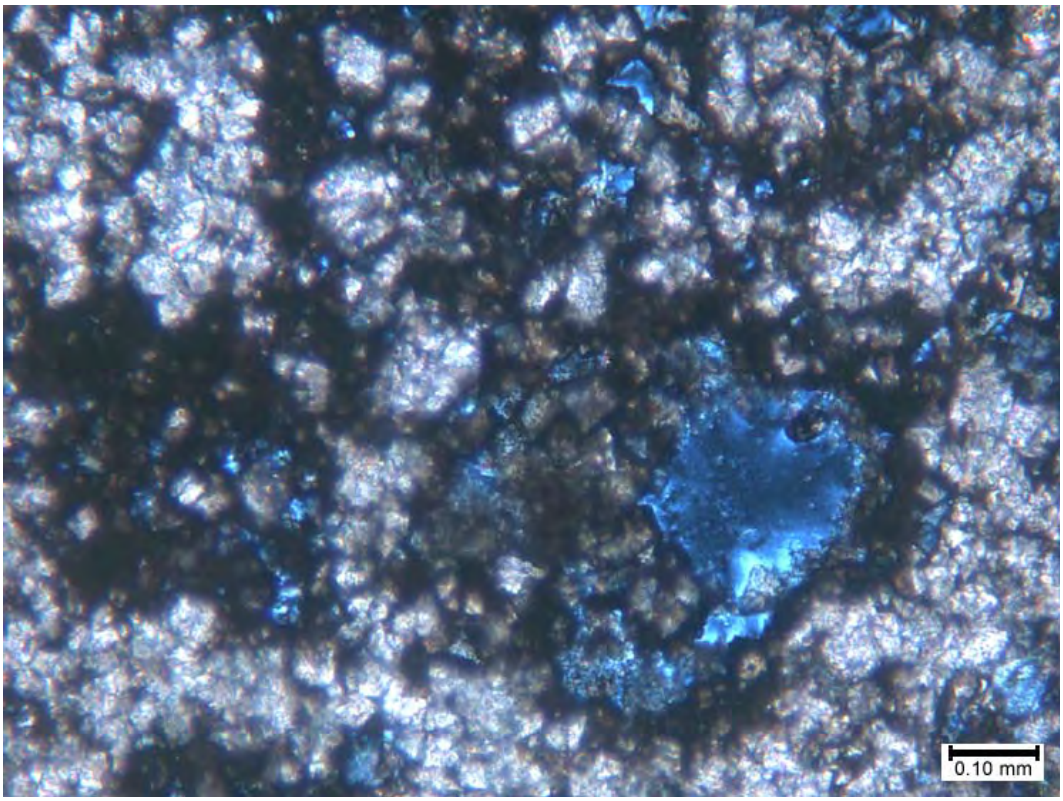

0.10 mm


0.10 mm

8442-43 feet

Top Photomicrograph

The same field of view as the previous two photomicrographs is shown here under crossed nicols. Under this lighting, most of the dolomite rhombs appear to be composed of much smaller subcrystals with different extinction positions.


0.10 mm

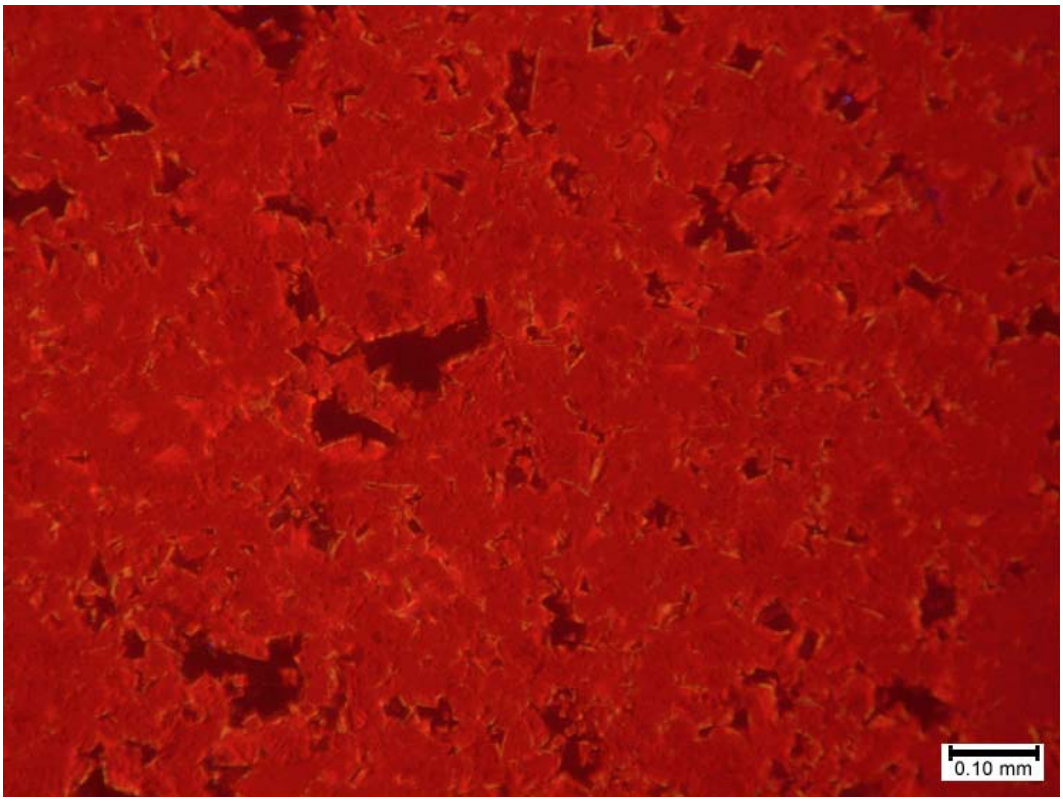
8442-43 feet

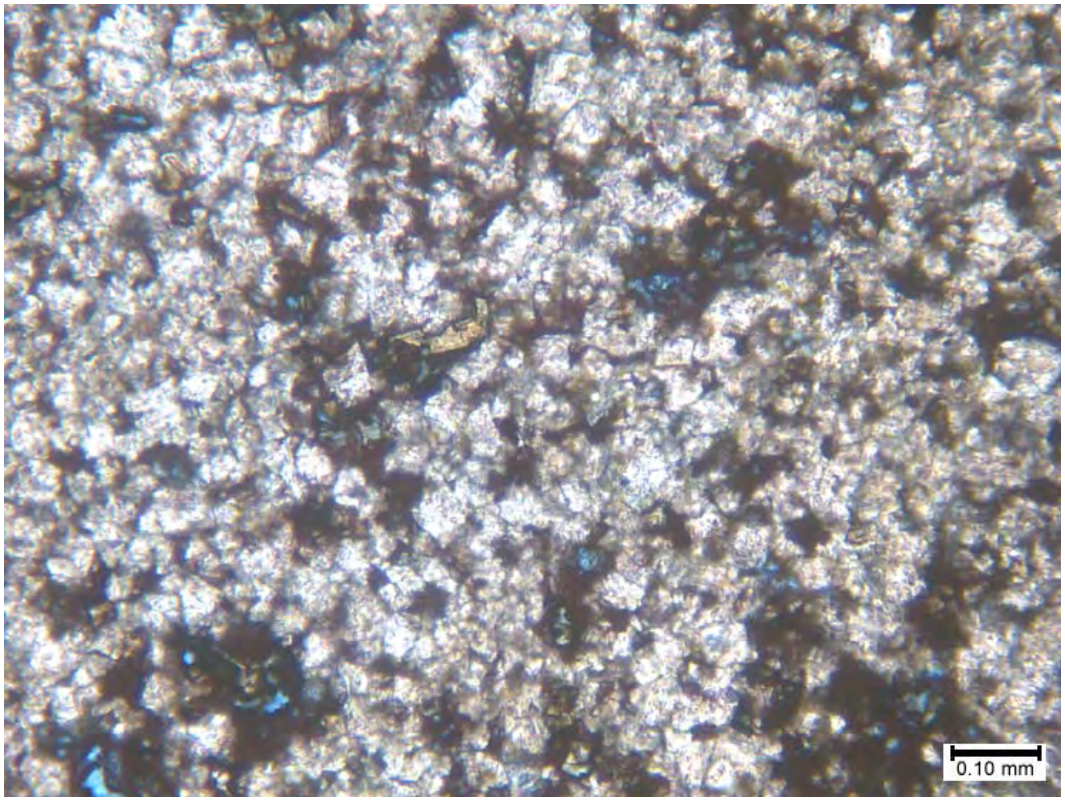
Top Photomicrograph

Original depositional textures and the outlines of original carbonate grains can be see in this cathodoluminescent image. Note the “ghosts” or outlines of former grains such as “hard” peloids throughout this field of view. The vast majority of the dolomite within this area of fabric selective dolomitization is a deep or intense red color. Between many of the grains, there is a lighter red luminescence where early cements have been dolomitization. Between other grains, there are interparticle (BP) pores that are still open (black here). In a few areas, these early pores have been solution-enlarged and lined with a later generation of coarse, rhombic dolomite.

Bottom Photomicrograph

The same field of view as the previous photomicrograph is shown here under plane light. The outlines of the original grains are not visible here as they are under CL illumination. However, most of the dolomite seen here is a finely crystalline replacement in which grains and interparticle pores still visible under CL. Occasional larger dolomite cement crystals with curved crystal faces (saddle dolomite) can be seen as the yellowish grain crystals in this image.


0.10 mm


0.10 mm

B-816 WELL,
LISBON FIELD

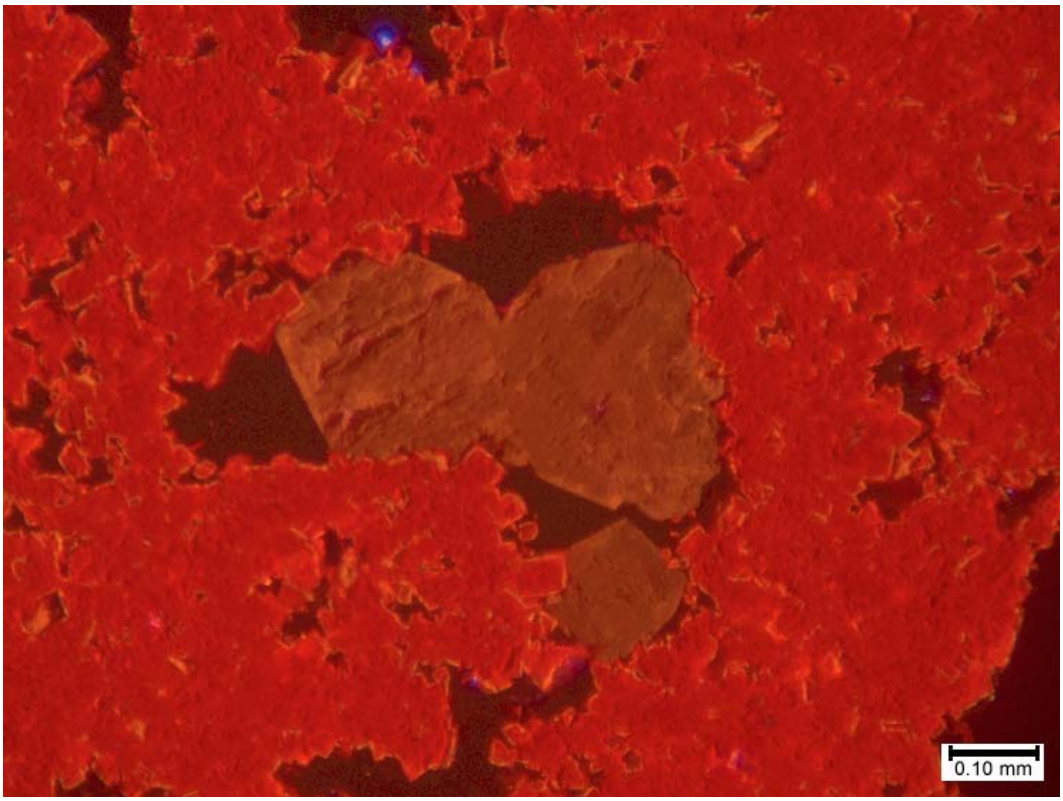
8486 feet

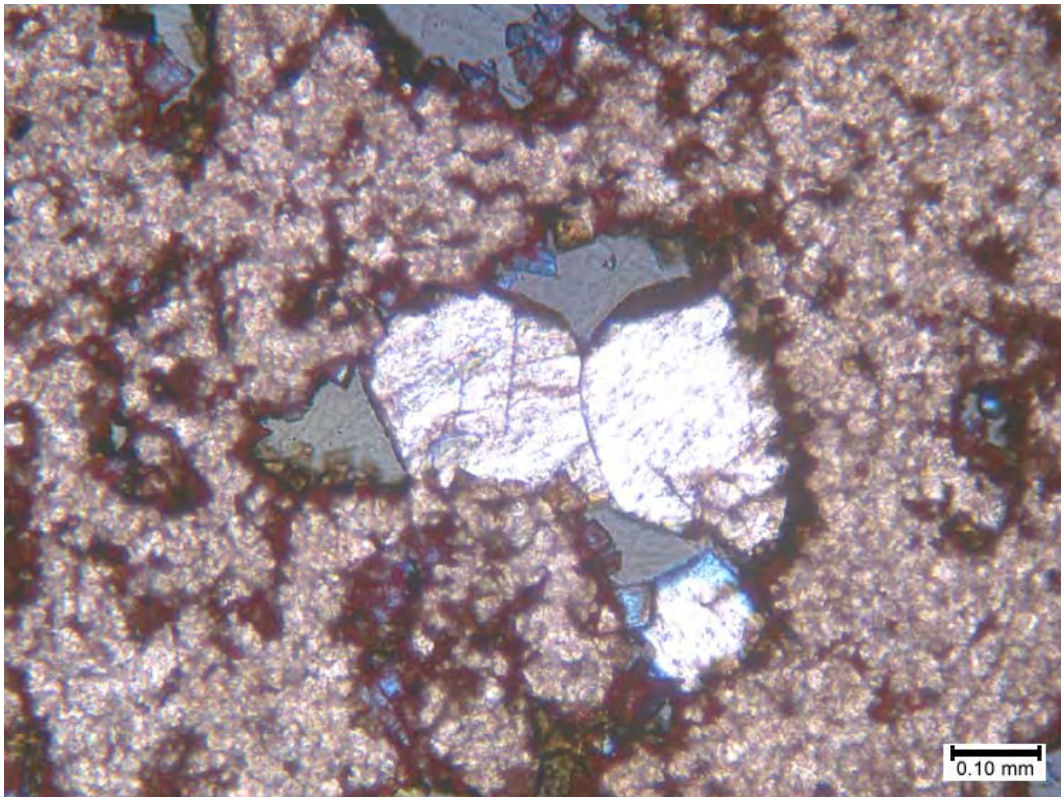
Top Photomicrograph

This overview of replacement dolomite shows generally well-formed, medium- to coarse-sized rhombs. Note that there is poor to no preservation of the original grain types or depositional fabric. Most of the dolomite appears to fluoresce a uniform red color. However, many of the larger crystals display orange overgrowths. Intercrystalline and solution-enlarged pores (small vugs, channel pores and possible molds) are black in the image. Note the large, late calcite spar crystals with orange luminescence within the large central pore in this micrograph.

Bottom Photomicrograph

The same field of view as the previous photomicrograph is shown here under plane light. The replacement dolomite appears as the light to medium gray materials due the cloudy, inclusion-rich nature of these dolomites. Larger dolomite rhombs and "saddles" occur as cements that line many of the pores. These cements have a bluish to yellowish cast in this image. The late calcite spar cements are white to clear, with relatively few inclusions. The black material lining most pores and crystals surfaces is mostly pyrobitumen.

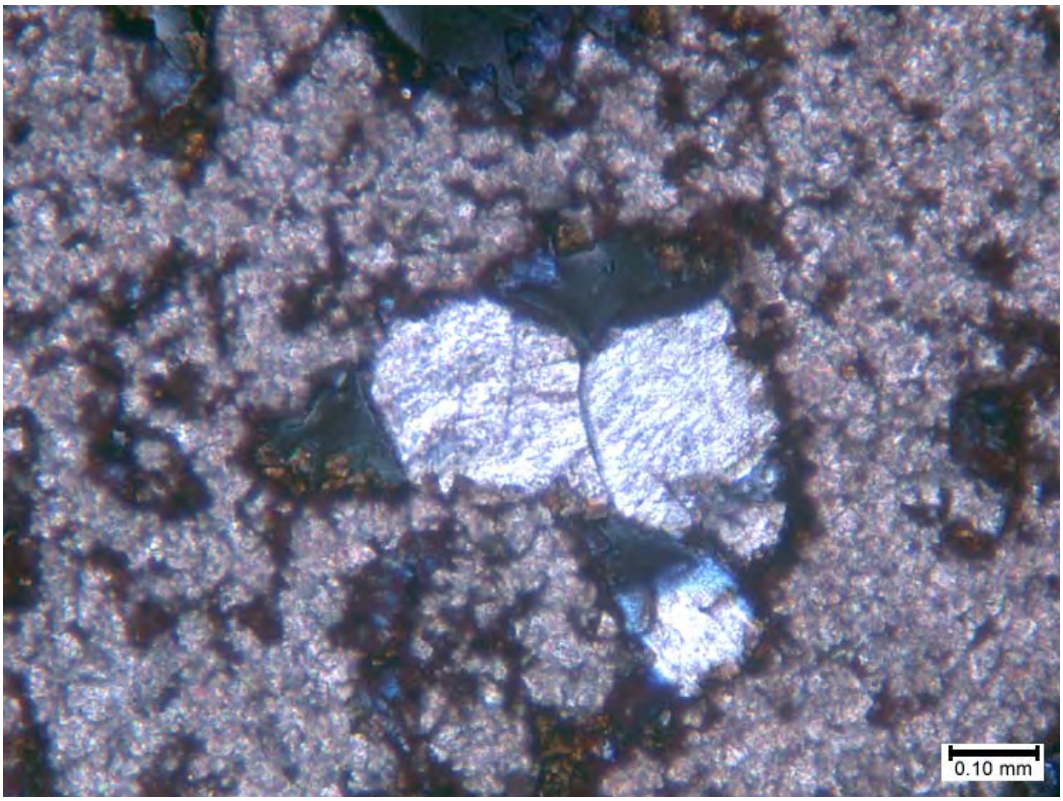

0.10 mm


0.10 mm

8486 feet

Top Photomicrograph

The same field of view as the previous two photomicrographs is shown here under crossed nicols. The replacement dolomites mostly display thick, cloudy interiors and thin clear rinds or overgrowths. The larger dolomite rhombs and "saddles" occur as cements that display some yellow to gold colors in their pore-lining habits. Upon close examination, these cements frequently display sweeping extinction and evidence of strained crystals. The late calcite spar cements have plane extinctions. The black (opaque) material lining most pores and crystals surfaces is mostly pyrobitumen.


0.10 mm

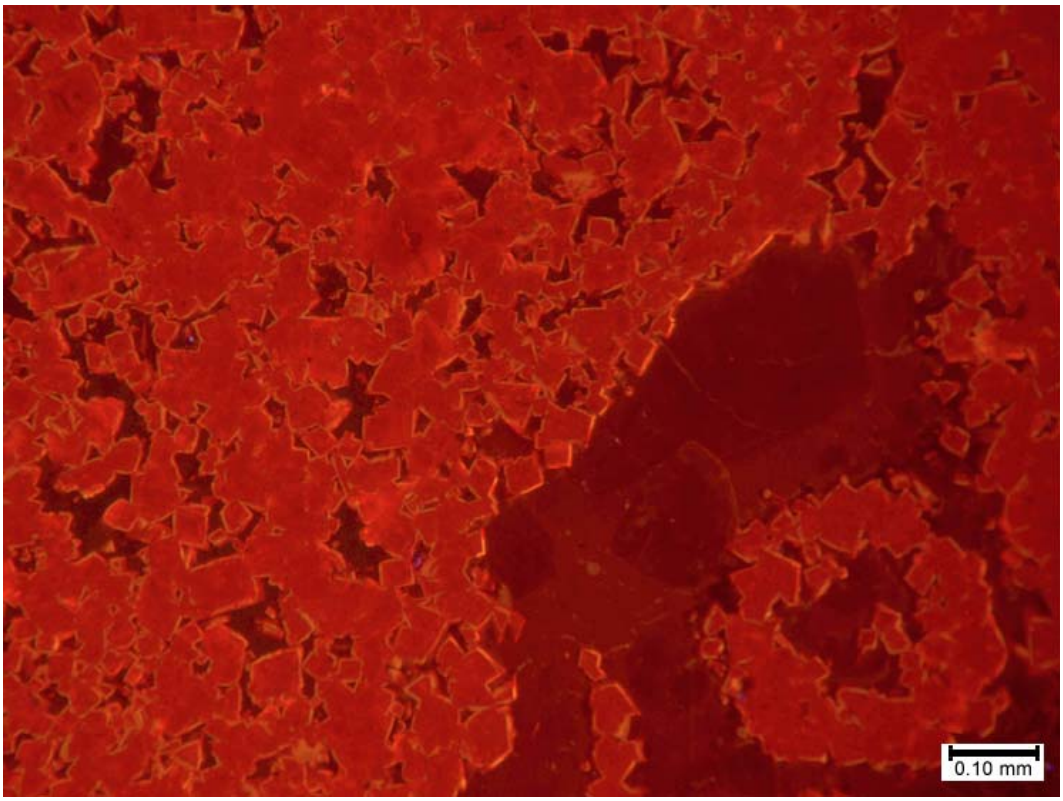
8486 feet

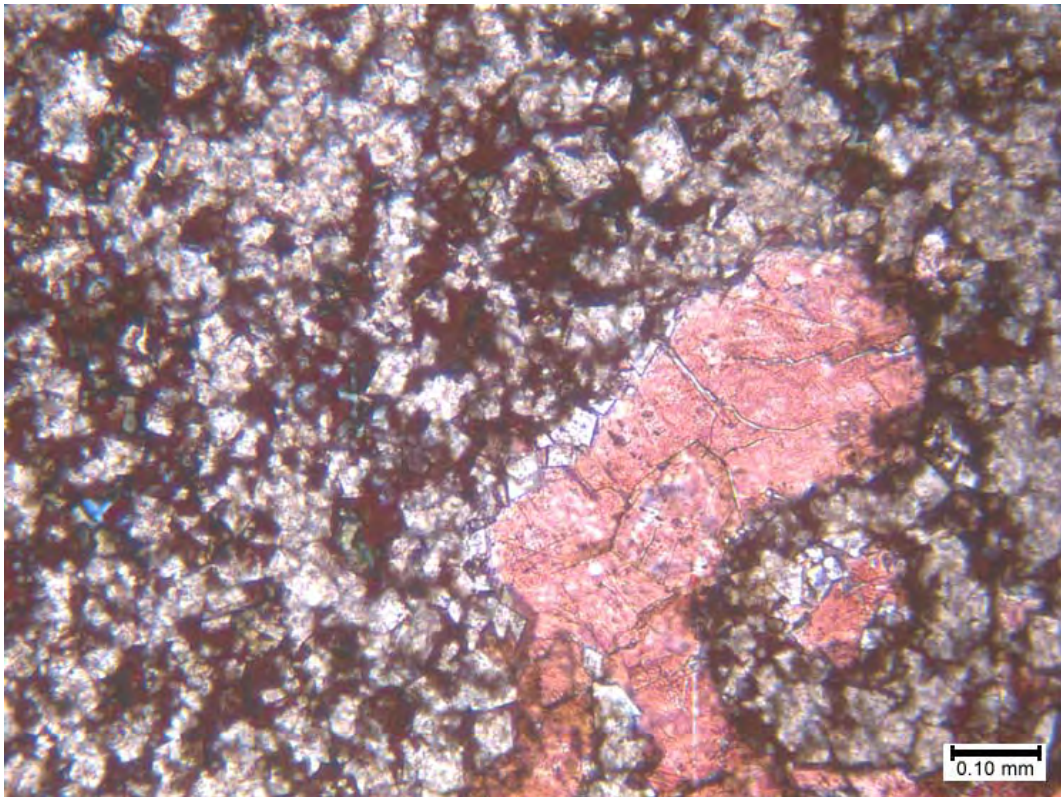
Top Photomicrograph

Most of this field of view shows fine to medium crystalline replacement dolomite in which there is very little preservation of depositional textures or original grains. Most of the individual dolomite crystals exhibit bright red luminescence with frequent occurrences of bright yellow to orange thin overgrowths. The black areas between the dolomite rhombs are pore spaces. However, the large area of dull orangish red in the lower center to right center is composed of calcite. This calcite is composed of echinoderm (probably crinoid) grains that exhibit the darkest luminescence and syntaxial calcite overgrowth (cements) that display slightly brighter luminescence. These overgrowths completely occlude the pore space in the region. The luminescent red dolomites replace this style of well-cemented encrinite.

Bottom Photomicrograph

The same field of view as the previous photomicrograph is shown here under plane light. This portion of the thin section has been stained with Alizarin Red-S solution to distinguish calcite (stained red) from dolomite (unstained, and white to light gray in this view). Note that most of this sample consists of cloudy replacement dolomite with some clear dolomites along the replacement front of the red-stained calcite areas. These calcites are the same as those with echinoderm grains overgrown with syntaxial cements. The abundant black materials seen in this photo are actually thin pore linings of mostly pyrobitumen. Open pores can be seen in the blue colors in this view. However, many more open pores are not seen because the bitumen linings block out the blue epoxy that has been injected into the pore spaces.

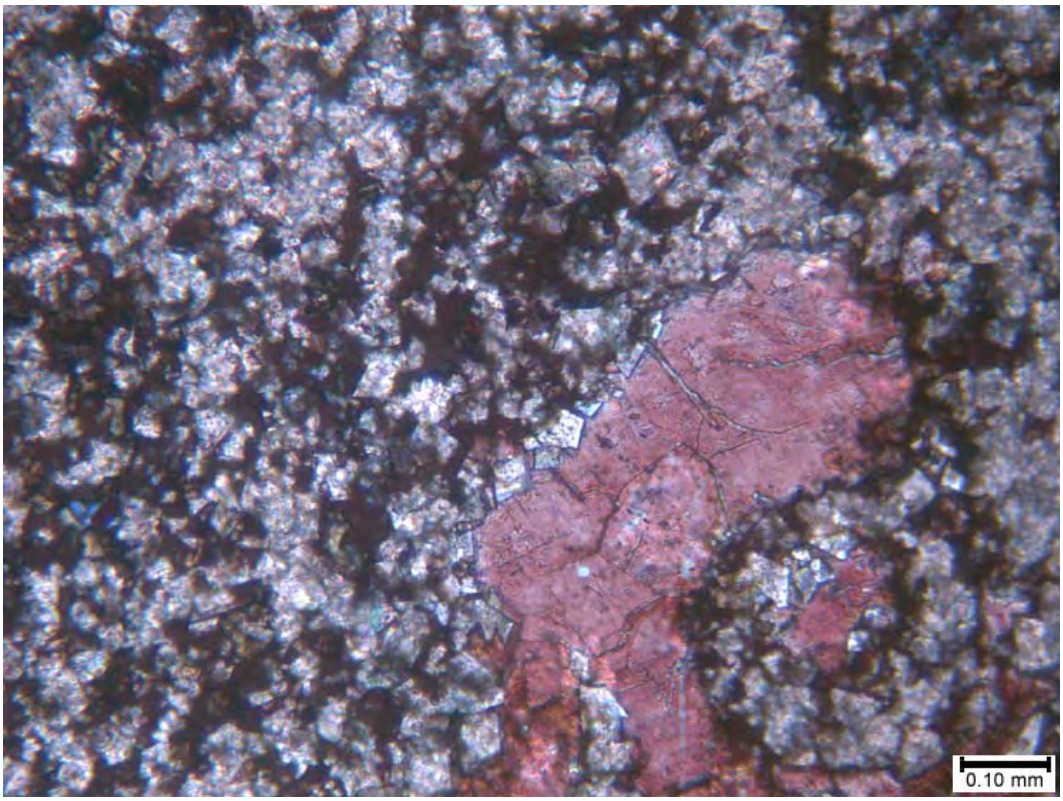

0.10 mm


0.10 mm

8486 feet

Top Photomicrograph

The same field of view as the previous two photomicrographs is shown here under crossed nicols. Note that some of larger dolomite rhombs seem to exhibit undulose or sweeping extinction indicative of possible saddle dolomites. The red-stained area of original (non-replaced) limestone (calcite) displays straight extinction.


0.10 mm

FLUID-INCLUSION MEASURMENTS

Well	Depth (ft)	Homogenization Temperature (°C)	Ice-Melting Temperature (°C)	Salinity (Wt % NaCl eq.)	Primary/ Secondary Inclusions	Mineral	Comments
B63	9939		-15.5	19.05	p	saddle dolomite	
B63	9939		-5.3	8.28	p	saddle dolomite	
B63	9939	70			p	saddle dolomite	oil + vapor
B63	9939	65			p	saddle dolomite	oil + vapor
B63	9939	65			p	saddle dolomite	oil + vapor
B63	9939	68			p	saddle dolomite	oil + vapor
B63	9939	65			p	saddle dolomite	oil + vapor
B63	9939	70			p	saddle dolomite	oil + vapor
B63	9939	60			p	saddle dolomite	oil + vapor
B63	9939		-11.3	15.27	s	late calcite	
B63	9939		-11.2	15.17	s	late calcite	
B63	9939		-11.1	15.07	s	late calcite	
B63	9939		-12	15.96	s	late calcite	
B63	9939		-7	10.49	s	late calcite	
B63	9939		-11.6	15.57	s	late calcite	
B63	9939		-5.8	8.95	s	late calcite	
B63	9939		-5.8	8.95	s	late calcite	
B63	9939		-5.8	8.95	s	late calcite	
B63	9939		-5.8	8.95	s	late calcite	
B63	9939		-5.5	8.55	s	late calcite	
B63	9939		-6.3	9.60	s	late calcite	
B63	9939		-6.1	9.34	s	late calcite	
B63	9939		-5.8	8.95	s	late calcite	
B63	9939		-5.8	8.95	s	late calcite	
B63	9939		-5.8	8.95	s	late calcite	
B63	9991.8		-12.7	16.62	p	late calcite	
B63	9991.8		-5.5	8.55	p	late calcite	
B63	9991.8		-14.5	18.22	p	late calcite	
B63	9991.8		-5.8	8.95	p	late calcite	
B63	9991.8		-12.3	16.24	p	late calcite	
B63	9991.8		-13.3	17.17	p	late calcite	
B63	10005		-6.8	10.24	p	late calcite	
B63	10005		-7.5	11.10	p	late calcite	
B63	10005		-7.5	11.10	p	late calcite	
B63	10005		-7.5	11.10	p	late calcite	
B63	10005		-8.2	11.93	p	late calcite	
B63	10005		-8.8	12.62	p	late calcite	
B63	10005		-7.3	10.86	p	late calcite	
B63	10005		-7.4	10.98	p	late calcite	
B63	10005		-9.5	13.40	p	late calcite	
B63	10005		-9.6	13.51	p	late calcite	
B63	10005		-7.2	10.73	p	late calcite	
B63	10005		-7.5	11.10	p	late calcite	
B63	10005		-6.5	9.86	p	late calcite	
D616	8356	60	-22.8		s	quartz	
D616	8356	58	-22.6		s	quartz	
D616	8356	58	-21.7		s	quartz	
D616	8356	89			s	quartz	
D616	8356	90			s	quartz	
D616	8356	77			s	quartz	
D616	8356	83	-24.9		s	quartz	
D616	8356	88	-27		s	quartz	
D616	8356	88	-19.2	21.82	s	quartz	

Well	Depth (ft)	Homogenization Temperature (°C)	Ice-Melting Temperature (°C)	Salinity (Wt % NaCl eq.)	Primary/ Secondary Inclusions	Mineral	Comments
D616	8356	79	-18.6	21.40	s	quartz	
D616	8356		-26.5		s	quartz	
D616	8356	88			s	quartz	
D616	8356		-27		s	quartz	
D616	8356		-27		s	quartz	
D616	8356	73	-23.4		s	quartz	
D616	8356	76			s	quartz	
D616	8356	88			s	quartz	
D616	8356	83			s	quartz	
D616	8356		-27		s	quartz	
D616	8356		-27		s	quartz	
D616	8356	76			s	quartz	
D616	8356	73			s	quartz	
D616	8356	105			s	quartz	
D616	8356	105			s	quartz	
D616	8356	105			s	quartz	
D616	8356	105			s	quartz	
D616	8356	118			s	quartz	
D616	8356	120			s	quartz	
D616	8356	118			s	quartz	
D616	8356	113			s	quartz	
D616	8356	113	-21.8		s	quartz	
D616	8356	123	-21.8		s	quartz	
D616	8356	123	-21.8		s	quartz	
D616	8356	119			s	quartz	
D616	8356		-7.8	11.46	s	quartz	
D616	8356		-9	12.85	s	quartz	
D616	8356		-9	12.85	s	quartz	
D616	8356	123	-16	19.45	s	quartz	
D616	8356	123			s	quartz	
D616	8356	123	-15.3	18.88	s	quartz	
D616	8356	123			s	quartz	
D616	8356	123			s	quartz	
D616	8356	123			s	quartz	
D616	8356	118	-16.2	19.60	s	quartz	
D616	8356	115			s	quartz	
D616	8356	115			s	quartz	
D616	8356	115			s	quartz	
D616	8356		-23.3		s	quartz	
D616	8356		-23.3		s	quartz	
D616	8356				s	quartz	
D616	8356		-21		s	quartz	
D616	8356		-23		s	quartz	
D616	8356		-22.2		s	quartz	
D616	8356	126	-20.5	22.71	p	quartz	
D616	8356	118	-20.5	22.71	p	quartz	
D616	8356	132.2	-22.7		p	quartz	
D616	8356	126	-22.8		p	quartz	
D616	8356	126	-21.6		p	quartz	
D616	8356	130	-22.4		p	quartz	
D616	8356	99	-21.4		s	quartz	
D616	8356	128			s	quartz	
D616	8356	130	-22.4		s	quartz	

Well	Depth (ft)	Homogenization Temperature (°C)	Ice-Melting Temperature (°C)	Salinity (Wt % NaCl eq.)	Primary/ Secondary Inclusions	Mineral	Comments
D616	8356	113			s	quartz	
D616	8356	108			s	quartz	
D616	8356	128			s	quartz	
D616	8356	108			s	quartz	
D616	8356	118			s	quartz	
D616	8356	118			s	quartz	
D616	8356	118			s	quartz	
D616	8356	118			s	quartz	
D616	8356	118			s	quartz	
D616	8356	113			s	quartz	
D616	8356	125	-19.9		s	quartz	
D616	8356	122	-22.3		s	quartz	
D616	8356	113			s	quartz	
D616	8356	120	-23.5		s	quartz	
D616	8356	113			s	quartz	
D616	8356		-20.2		p	quartz	
D616	8356		-21.3		p	quartz	
D616	8356		-20.8		s	quartz	
D616	8356	128	-22.8		p	quartz	
D616	8356	130	-22.3		p	quartz	
D616	8356		-22.8		s	quartz	
D616	8356		-22.8		s	quartz	
D616	8356		-22.1		p	early calcite	
D616	8356		-22.5		p	early calcite	
D616	8356		-22.5		p	early calcite	
D616	8356		-22.5		p	early calcite	
D616	8356		-24.2		p	early calcite	
D616	8356		-19.5		p	early calcite	
D616	8356		-24.1		p	early calcite	
D616	8356		-23.2		p	early calcite	
D616	8356		-24.1		p	early calcite	
D616	8356		-24		p	early calcite	
D616	8356		-21.2		p	early calcite	
D616	8356		-23.2		p	early calcite	
D616	8356		-23.6		p	early calcite	
D616	8356		-20.3		p	early calcite	
D616	8356		-23.2		p	early calcite	
D616	8356	43			p	early calcite	oil+ vapor
D616	8356	52			p	early calcite	oil+ vapor
D616	8356	48			p	early calcite	oil+ vapor
D616	8356	43			p	early calcite	oil+ vapor
D616	8356	48			p	early calcite	oil+ vapor
D616	8356	48			p	early calcite	oil+ vapor
D616	8356	53			p	early calcite	oil+ vapor
D616	8356	55			p	early calcite	oil+ vapor
D616	8356	64			p	early calcite	oil+ vapor
D616	8356	63			p	early calcite	oil+ vapor
D616	8356	68			p	early calcite	oil+ vapor
D616	8356	68			p	early calcite	oil+ vapor
D616	8372		-21.5		p	early calcite	
D616	8372		-24.3		p	early calcite	
D616	8372		-21.5		p	early calcite	
D616	8372		-24.7		p	early calcite	

Well	Depth (ft)	Homogenization Temperature (°C)	Ice-Melting Temperature (°C)	Salinity (Wt % NaCl eq.)	Primary/ Secondary Inclusions	Mineral	Comments
D616	8372		-25.5		p	early calcite	
D616	8372		-25.5		p	early calcite	
D616	8372		-22.6		p	early calcite	
D616	8372		-25		p	early calcite	
D616	8372		-24		p	early calcite	
D616	8372		-24		p	early calcite	
D616	8372		-22		p	dolomite	
D616	8372		-23		p	dolomite	
D616	8372		-24.5		p	dolomite	
D616	8372		-24.5		p	dolomite	
D616	8372	43			s	calcite	oil+ vapor
D616	8372	40			s	calcite	oil+ vapor
D616	8372	40			s	calcite	oil+ vapor
D616	8372	39			s	calcite	oil+ vapor
D616	8372	40			s	calcite	oil+ vapor
D616	8372	40			s	calcite	oil+ vapor
D616	8372	39			s	calcite	oil+ vapor
D616	8372	40			s	calcite	oil+ vapor
D816	8433		-25		p	dolomite	
D816	8433				p	dolomite	
D816	8433				p	dolomite	
D816	8444		-17	20.22	p	dolomite	
D816	8444		-17	20.22	p	dolomite	
D816	8444		-20.5	22.71	p	dolomite	
D816	8444		-20	22.38	p	dolomite	