GEOLOGY OF THE LOWER TRANSITION ZONE OF THE GREEN RIVER OIL SHALE, COLO

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TRANSITION ZONE

THAT PART OF THE LOWER GREEN RIVER OIL SHALE THAT WAS DEPOSITED IN LAKE WATERS TRANSITIONING FROM FRESH OR BRACKISH TO SALINE
METHODS OF STUDY

- LITHOLOGY
- XRD MINERALOGY
- FLUORESCENCE MICROSCOPY
- SPECIFIC GRAVITY OF SHALE OIL
R0 AND L0 OIL SHALE ZONES
Shell core hole 22X-1
Sec. 1. T. 2 S., R. 98 W.
Rio Blanco County, CO

Interbedded organic marlstone (90%) and clay shale (10%): non-lithic to dark chocolate brown to dusky brown, thinly bedded, generally laminated, spalls into 1/2 to 3 in blocks; clay shale is greyish brown with bluish cast, massive, hard, somewhat flaky.

767.16 m (10)

Interbedded clay shale (50%) organic marlstone (80%) and claystone (50%): clay shale is greyish brown, dense, very weakly bedded, and in layers 1 to 10 cm thick; marlstone is dark brown, in layers 2 to 7 cm thick; some blue-grey claystone.

Core loss.

Organic marlstone, dark chocolate brown with brownish gray cast, spalls into thin blocks 2 to 5 cm thick; calcitization, scattered white calcite veins near 3 mm thick, abundant, may be good stratigraphic marker.

Organic marlstone, dark yellowish brown, thickly bedded, some small yellowish bedding parallel discontinuities.

Organic marlstone, dark chocolate brown grading downward to dark grey, layered 3-5 cm thick, non-planar, spalls into many thin, polygon chips 2 to 4 cm thick, non-calcareous, probably clayey.

Interbedded organic marlstone (100%) and claystone (50%): mottled dark chocolate brown, yellowish brown, claystone is gray, dark gray, thickly bedded, some discontinuities.

Organic marlstone, brownish black and dark blackish brown, spalls marlstone-gravelly breccia 2-10 cm thick that have probable contacts with marlstone above and below; some elliptical black grey pebbles of calcite in lower part.

Flint, dark chocolate brown, fissility, few black grey claystone layers, small the bedding plane surface.

Organic marlstone, dark brownish-bluish grey, in thin 0-5 mm layers.

Organic marlstone, brownish-gray, non-calcareous, few 1 to 10 mm black layers of dark chocolate brown, organic marlstone.

Organic marlstone, dark brownish black, some discontinuities.

Claystone (50%) and organic marlstone (50%): claystone is brownish gray to black, in layers to 18 cm thick.

Organic marlstone, dark chocolate brown to brownish black, few leafy grey non-carbonate claystone layers, fine black hydrous minerals that contain clear dray non-calcareous, small bedded clasts.

271.36 ml 4 mm; grey, fine-grained, anatase.

275.36 ml 12

Organic marlstone, dark brownish-black and brownish black with overall brownish grey cast, many thin line bedding plane fractures spaced about 5 to 15 cm apart, probably contains a significant amount of clay minerals.
SHALE OIL
SPECIFIC GRAVITY
PROFILES IN TWO
DRILL HOLES
Shell 22X-1
Polished specimen S-2
Depth: 708.48 meters,
Oil shale zone L 2

Organic marlstone, dark
blackish brown,
prominently laminated,
few vertical fractures filled
with black hydrocarbon

18 GPT

XRD
Quartz
Nahcolite
Dawsonite
Dolomite
Na and K? feldspar
Pyrite?

Fluorescence mode
Greenish yellow alginite with thin
laminae and small blebs of yellow
lamalginite, scattered tiny blebs of
pyrite (black)
Shell 22X-1
Polished specimen S-3
Depth: 718.69 meters,
Oil shale zone R2

Nahcolitic organic
marlstone, yellowish brown,
bedding-parallel yellowish
blebs of dolomite, exhibits
flow structure

50 GPT

XRD
Quartz
Dolomite
Na- and K-feldspar

FLUORESCENCE MODE
Bright yellowish-orange ground
mass, Flow structure, scattered
3 to 9 micron grains of pyrite
(black)
CONCLUSIONS

✓ LITHOLOGY: INTERBEDDED ORGANIC SHALE AND ORGANIC MARLSTONE

✓ MINERALS: QUARTZ, FELDSPARS, ILLITE, DOLOMITE, AND DAWSONITE

✓ MINERAL PROFILES:
  DAWSONITE FIRST APPEARS AS ILLITE DECREASES TO ZERO
  QUARTZ PROFILE FOLLOWS DAWSONITE IN ABUNDANCE
  FELDSPARS INCREASE IN ABUNDANCE WITH DECREASE IN ILLITE

✓ ORGANIC MATTER:
  ASSAY-OIL SPECIFIC GRAVITY DECREASES WITH DEPTH
  SPECIFIC GRAVITY PROFILES FOR TWO WELLS ARE SIMILAR
  NO OBVIOUS VISUAL CHANGES IN ORGANIC MATTER