

Pore Morphometrics and Thermal Evolution of Organic-Matter Microporosity, Colorado Group, Western Canada Sedimentary Basin



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The broad areal extent of the WCSB and the availability of samples throughout the basin provide an excellent framework for studying organic matter micropore morphometrics in relation with thermal maturity. Imaging and pore characterization of the samples from Colorado Group of the WCSB has been conducted using the FIB/SEM system (LEO (Zeiss) 1540XB) in Western University's Nanofabrication Facility. Phyllosilicate framework porosity (PF) pores and organic matter (OM) pores are the dominant pore types in the lower Colorado Group (Fig.1). OM pores are thought to develop as a result of kerogen degradation during catagenesis, and are

considered as evidence of thermal maturity of the carbonaceous mudstone (Curtis et al., 2010). However, the Colorado Group samples analyzed thus far appear to exhibit exceptions to this hypothesis. OM pores are distributed in a manner that is not readily related to thermal maturity or burial history. This contributes to a high level of reservoir heterogeneity that presents significant challenges for flow characterization. Coccoliths are common in these samples (Fig. 2). They are found as mainly individual clasts and some are aggregates. Preservation is moderate to good. As a result of abundant fecal pellets composed of coccolithic debris, the Second White Specks Formation has a speckled appearance (Bloch et al., 1993). In addition, pyrite exists in almost all the samples. The crystal form is usually octahedral, act as a single large crystals or small aggregates or pyrite framboids (Fig. 3).

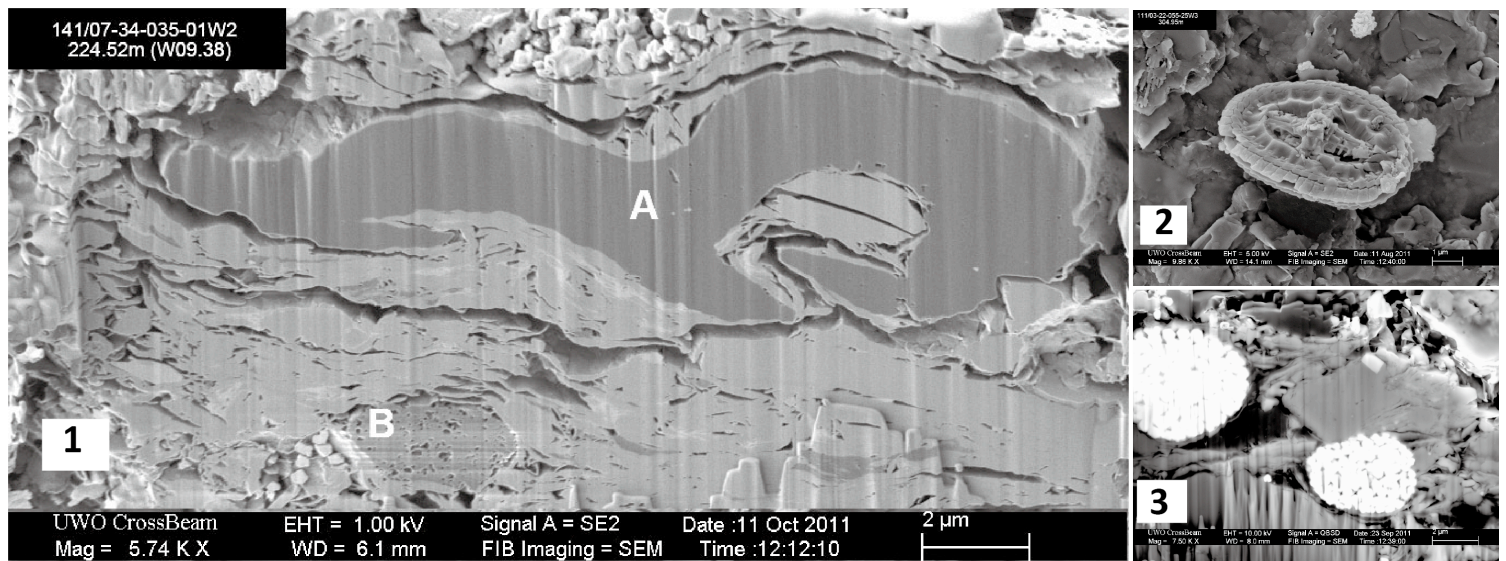


Figure (1) SEM image from 141/07-34-035-01W2 (224.52 mKB) illustrates heterogeneity of OM porosity development. Notice that OM porosity development in kerogen maceral "A" is limited to isolated micropores, whereas kerogen maceral "B" exhibits denser development of larger micro- to meso-pores. (2) An intact coccolith with well preserved structure. Taxonomic classification of the species has not been determined. (3) BSE image shows pyrite framboids as bright area.

Bloch, J., Schröder-Adams, C., Leckie, D., McIntyre, D., Craig, J., and Staniland, M., 1993, Revised stratigraphy of the lower Colorado Group (Albian to Turonian), western Canada: *Bulletin of Canadian Petroleum Geology*, v. 41, p. 325.
Curtis, M., Ambrose, R., and Sondergeld, C., 2010, Structural Characterization of Gas Shales on the Micro- and Nano-Scales. SPE Paper 137693, Canadian Unconventional Resources and International Petroleum Conference, 19-21 October 2010, Calgary, Alberta, 15p.