POROSITY CHARACTERIZATION OF VARIOUS ORGANIC-RICH SHALES FROM THE WESTERN CANADIAN SEDIMENTARY BASIN, ALBERTA AND BRITISH COLUMBIA, CANADA

Raphael A. J. Wüst (Trican Geological Solutions Ltd.), Brent R. Nassichuk (Trican Geological Solutions Ltd.), R. Marc Bustin (University of British Columbia,)

Copyright © 2013 by The American Association of Petroleum Geologists

ABSTRACT
Scanning electron microscopy (SEM) of shales from three unconventional gas/liquid plays (Nordegg, Montney, Duvernay) of the Western Canadian Sedimentary Basin were combined with routine analytical investigations (x-ray diffraction, source rock analyses, mercury porosimetry, and petrography) to characterize mineral composition, mineral assemblage, morphology, organic content, and porosity. The investigations demonstrated that despite marked diagenetic differences between these shales, some common textural and pore characteristics occurred in all samples. The study showed that SEM morphological investigations of unconventional shale reservoirs provided important information about mineral aggregates, cementation, and clay mineral distribution, which allows interpretations about diagenetic history. Combining petrographic analyses with SEM is critical in sediments with pronounced cementation and mineral overgrowth. Conventional secondary electron SEM studies of untreated samples have several advantages over focused ion beam (FIB) milled surfaces as morphological characteristics of larger areas can be evaluated. The study showed that the organic material may not be fully identified, but organic fragments and some bituminous material can still be recognized. In general, abundant large pores (200 to . 2000 nm) can be observed under SEM, but other techniques, such as the mercury porosimetry, failed to identify these larger pores in these shales. The main morphological porosity types in these shales were intergranular (between particles), dissolution, residual growth, fracture, and phyllosilicate pores. The high number of 5- to 20-nm pores as determined by mercury porosimetry could not be confirmed by SEM, which may have been because of resolution issues. Hence, future porosity characterization of gas shales needs to investigate these problems of discrepancy between analytical and imaging technologies.

To order the full paper, visit https://www.researchgate.net/publication/259503533_Porosity_characterization_of_various_organic-rich_shales_from_the_Western_Canadian_Sedimentary_Basin_Alberta_and_British_Columbia_Canada