

## Solid Bitumen as a Determinant of Reservoir Quality in the Montney Tight Gas Siltstone Play

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### Summary

In this study of the Triassic Montney tight gas siltstone play in Alberta and British Columbia petrophysical measurements of drill-core samples (porosity, pore throat size and water saturation) are integrated with pyrolysis data, organic petrography observations and SEM imaging to show that reservoir quality in the gas window is strongly influenced by the pervasive presence of solid bitumen. The bitumen formed as a pore-filling liquid oil phase (Figures 1, 2) that was subsequently thermally degraded with further burial and increase in temperature. The amount of bitumen filling the paleopore network can be expressed as bitumen saturation and this attribute is found to be the dominant control on pore throat size distribution (Figure 3). Siltstones in economic portions of the Montney tight gas fairway commonly have porosity in the range of 3 to 7%. The results of this study show that reservoir quality in this economically key porosity range is influenced more strongly by bitumen saturation than by conventional determinants of porosity and permeability such as grain size, sorting, clay content and cementation. The concept of degraded bitumen as an important control of reservoir quality elucidated here for Montney siltstones likely has application to the technical and economic evaluation of other tight gas plays particularly those within indirect basin-centered gas accumulations.

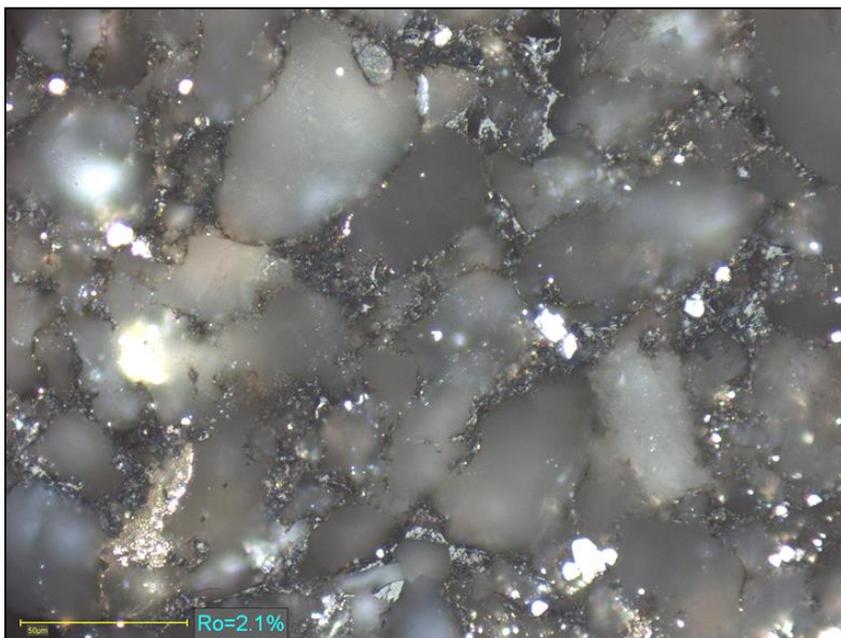


Figure 1 - Photomicrograph (oil immersion, white incident light) of a typical Montney siltstone from the dry gas window showing pervasive, pore-filling, solid bitumen. Yellow scale bar is 50 µm.

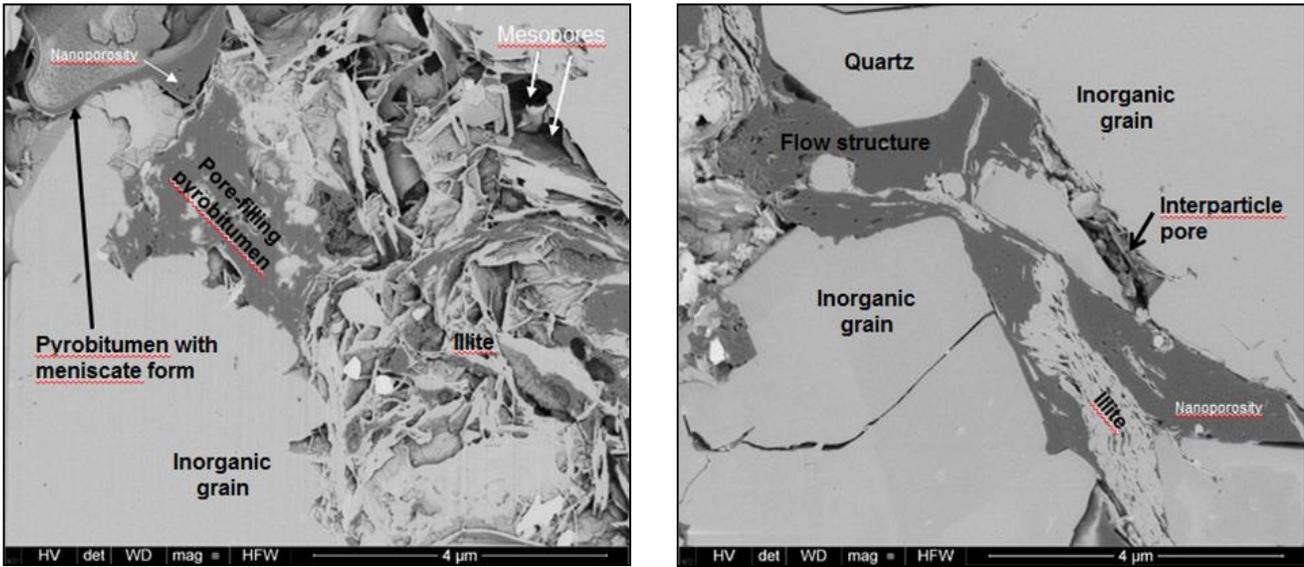


Figure 2 – FIB-SEM images of two Montney core samples from the dry gas window showing paleopore system substantially filled with solid bitumen and illite platelets. Meniscate form (left image) and flow structure (right image) indicate the solid bitumen was previously a liquid oil phase. Scale bar is 4 µm.

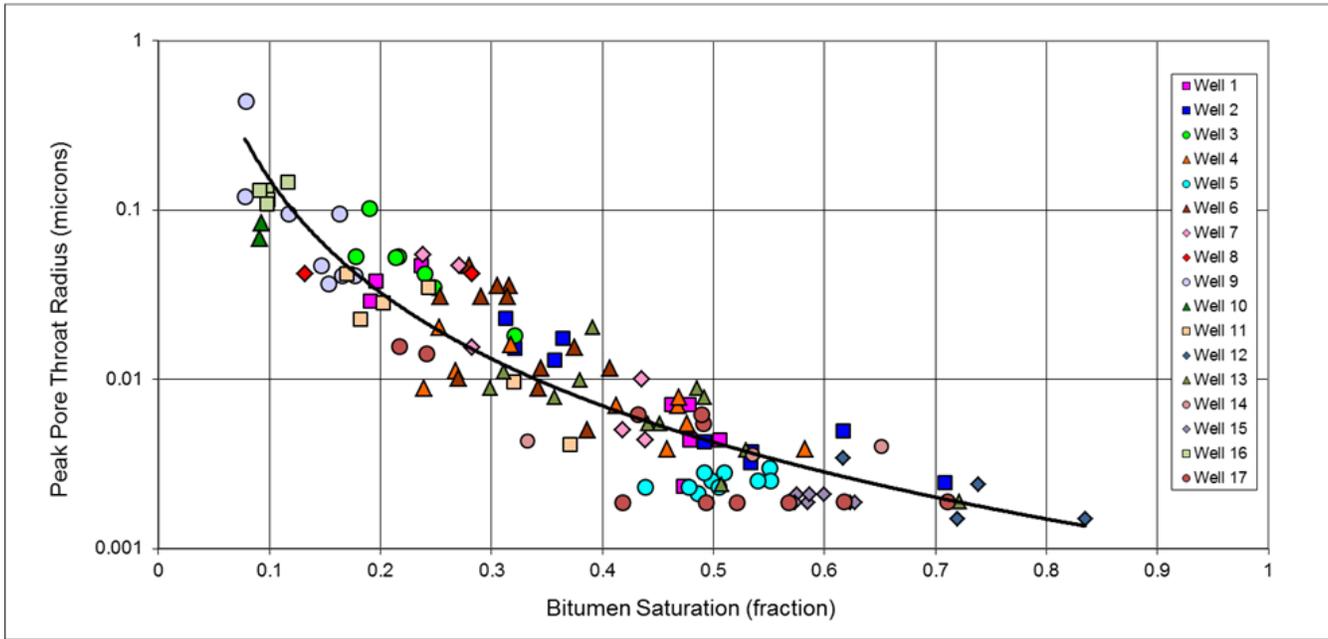


Figure 3 – Cross-plot of bitumen saturation versus peak pore throat radius for 17 wells with same-sample measurements of porosity, total organic carbon (TOC), and mercury injection capillary pressure.

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