ROCK CHARACTERISTICS OF OIL-, CONDENSATE- AND DRY GAS-PRODUCING WELLS OF THE UNCONVENTIONAL DEVONIAN DUVERNAY FORMATION, CANADA


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ABSTRACT
The Devonian strata of the Western Canada Sedimentary Basin has a wealth of potential hydrocarbon source rocks including the unconventional Upper Devonian Duvernay Formation of the Woodbend Group, a prolific oil-producing formation that has fed into the overlying strata. The Duvernay Formation has seen investments of over $7 billion since 2010 for land rights, corporate acquisitions/divestures and drilling activity. The Kaybob area is currently the center of exploration and production in the play with over 100 wells drilled or licensed. Notable operators include Athabasca, Encana, Talisman, Shell, Chevron, Conoco Phillips, Husky and Celtic/Exxon. One of the pioneering wells at Kaybob South (Celtic et al. HZ 15-33-60-20W5) tested 2.1 mmcf/d of gas with 75 bbls/mmcf of 560 API condensate at a reservoir pressure of 63 MPA (~19 kPa/m pressure gradient). Exploration companies are touting GIP reserves ranging wildly from 45 to >200 bcf/section. Despite the positive initial production numbers, the Kaybob area has a complex geological and stratigraphic framework that needs to be understood. Thermal maturity of the organic matter in the Duvernay Formation ranges from immature in the eastern portion of the basin to dry-gas window in the west. Hence, location of each well is key to optimizing the production potential. Here we present new rock property data of wells along a transect from the oil-prone to the dry gas-prone area in the Kaybob area and compare the properties with the existing hydrocarbon production information. Rock composition, fabric, organic matter content and maturity as well as amount, distribution and size of pores and pore networks are evaluated. The data is displayed in a stratigraphic context and current production zones are highlighted. The discussion also integrates the thermal history and possible tectonic overprints of the area to evaluate the potential of developing production through the various thermal maturity zones and the possible hydrocarbon storage/flow of these rocks.

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