Hydrocarbon Source Rock Potential of the Whitehorse Trough, a Frontier Basin in Southern Yukon

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Abstract

The Whitehorse Trough in southern Yukon is a frontier basin that is thought to contain gas and possibly oil. It formed in the early Triassic as an arc-marginal basin between the ancient North American margin to the east and the volcano-plutonic Stikine Terrane to the west. Strata in the Trough consists of the Upper Triassic Lewes River Group (informally subdivided into the Povoas and Aksala formations), the Lower-Middle Jurassic Laberge Group (informally subdivided into the Richthofen, Nordenskiold and Tanglefoot formations) and the Jura-Cretaceous Tantalus Formation. Over 400 samples from these units have been analyzed by programmed pyrolysis and combustion, which together with coal rank, vitrinite reflectance, and the color of microfossils, indicates the following: the Povoas formation has no source rock potential; the Aksala formation is a poor source rock, probably gas-prone and postmature; the Richthofen formation is a poor to fair source rock, gas-prone and postmature; the Nordenskiold formation has no source rock potential; and the Tanglefoot and Tantalus formations are good to very good potential source rocks, mainly gas-prone with a possibility of oil and mature. Petroleum fluid inclusions are present locally in the Tanglefoot and Tantalus formations. The Aksala and Richthofen formations are interpreted as spent source rocks, whereas the Tanglefoot and Tantalus formations are interpreted as potential source rocks and possibly effective source rocks. The most prospective areas for hydrocarbon exploration in the Whitehorse Trough are Division Mountain, Tantalus Butte and Five Finger Rapids