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# The Distribution and Origin of Hydrogen Sulphide in the Triassic Montney Formation, British Columbia and Alberta

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## Summary

The distribution and origin of hydrogen sulphide ($H_2S$) within the Triassic Montney Formation were investigated in British Columbia and Alberta. Hydrogen sulphide is a toxic gas that can be co-produced with hydrocarbons and impacts well economics and the environment.

This study has mapped the $H_2S$ concentration in the Upper, Middle and Lower Montney Formation. The Montney Formation has tested or produced $H_2S$ gas at concentrations between 0.001% and 22%. The stratigraphic and lateral variation in the $H_2S$ concentration can be inexplicable.

Sulphur available to generate $H_2S$ includes bacterial sulphide reduction, kerogen cracking, sulphide oxidation, decomposition of well-completions surfactants or fluid migration of sulphate ions from sulphur-rich evaporites. The isotopic ratios of sulphur and oxygen will depend on the source and the formation pathway of the $H_2S$ gas and can be used to help model $H_2S$ gas generation. Samples were collected from the Triassic Charlie Lake, Doig, Montney formations and the Devonian Nisku, Elk Point and Muskeg formations. Sulphate minerals (i.e., anhydrite) were isolated using a chemical mineral separation technique. These samples were analysed for sulphur and oxygen isotopes at the Ján Veizer Stable Isotope Laboratory, University of Ottawa. Sulphate and oxygen isotopic ratios from sulphate minerals within the Montney Formation and the Charlie Lake Formation have a range between 9.0 to 18.0 ‰ V-CDT and -5.0 to 19.0 ‰ V-SMOW, respectively. These isotopic ratios differ from the sulphur and oxygen isotopic ratios from sulphate minerals sampled from Devonian rock sources which vary between 18.0 to 30.0 ‰ V-CDT and 12.0 to 30 ‰ V-SMOW, respectively. The sulphur isotopic ratio measured from $H_2S$ gas of producing Montney Formation wells varies between 9.3 and 20.9 ‰ V-CDT.

Preliminary results from isotopic analyses suggest that the sulphur that generated $H_2S$ in the Montney Formation is from Triassic sulphates or a mixture of Triassic and Devonian sources and not solely from Devonian rocks as first expected. It is postulated that the sulphate ions have migrated through localised fractures into the Montney Formation and then the sulphate is used to generate $H_2S$. Another possibility is the $H_2S$ gas formed in the Charlie Lake Formation and/or Devonian rocks and then migrated into the Montney Formation. Textural relationships between the reservoir rock and the sulphate minerals is being examined and will determine the $H_2S$ generation model for the Montney Formation.