

Helium occurrences and lithium brine potential in the Williston Basin, southwestern Manitoba

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Summary

Southwestern Manitoba is known for its oil and gas fields, including the world class Virden Field. Within and below those oil reservoirs occurs other important commodities whose extraction can benefit from the decades of exploration work done by the energy industry, including helium accumulations and lithium brines. Both these elements are critical in today's modern, high-tech world, and both have potential in Manitoba. Helium is often measured and reported in gas analyses, and lithium, although less often, measured and report in water analyses collected during drill stem tests on oil wells. These analyses are required to be submitted under the Manitoba Oil and Gas Act, and are subsequently available in the technical well files.

Manitoba is a favorable place to look for helium due to its geological location and the composition of its sediments and underlying basement crustal rocks. Helium occurrences have been identified and measured during oil and gas operations resulting a concentration of helium occurrences in oil producing areas. This could be representative of the larger helium potential in the Williston Basin in Manitoba. A search through technical well files resulted in the identification wells that have helium concentrations at or above the economic cut off for crude helium at 0.3 mol %, with the highest results coming from a well at 14-17-20-5W1 at 2.00 mol %. This helium concentration is from the lower Winnipeg Formation sandstone to weathered Precambrian regolith interval. The second highest helium values were from the Middle Bakken Member to Torquay Formation interval in 16-22-11-28W1 with 1.30 mol %. Considering Manitoba has a low drilling density of wells that penetrate pre-Mississippian horizons, these results are encouraging and suggest good potential for helium accumulations.

Production of lithium from deep brines in continental sedimentary basins may be a cost-effective source of lithium. Southern Manitoba has a complex groundwater aquifer system, with salinities ranging from brines in the deeper aquifers to freshwater in the shallower and eastern aquifers. Manitoba's oil and gas operations produce large quantities of these brines, which contain a wide range of trace elements. Although very limited results indicate the lithium concentrations in Manitoba's brines are low, extrapolation of better, more comprehensive results from Saskatchewan suggests that there is potential for lithium concentrations to be higher than currently recorded in Manitoba.