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THE CARNALLITITE DEPOSITS OF SASKATCHEWAN: RESOURCE PROBLEM OR SOLUTION MINING OPPORTUNITY?

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Abstract

The purpose of this paper is to present a broad overview of the state of exploration for, and development of, Saskatchewan's vast deposits of magnesium-bearing carnallite rock. The host mineral is carnallite, chemical formula $KClMgCl_2 \cdot 6H_2O$ which is a form of potassium and magnesium chloride with 6 molecules of water. The carnallite is present within the upper beds of the Middle Devonian Prairie Evaporite Formation, a thick (up to several hundred meters) sequence of evaporites including the minerals halite, sylvite, and carnallite.

Carnallite has been studied as a feedstock for a magnesium industry in Saskatchewan, with the end product being either magnesia or dead-burnt MgO or refining to magnesium metal; no historical efforts were focused upon solution-mining the deposits for their potassium content.

Carnallite occurs either as an accessory mineral in sylvite beds or as a massive carnallite rock. When the carnallite mineral is present in its accessory form, even in small amounts, it can have a negative effect upon conventional underground sylvite and especially sylvite solution mining operations. This is because carnallite is a rock mechanically weak mineral and its effect upon the solubility curves for the halite – sylvite – carnallite system greatly complicate sylvite solution mining efforts. When the carnallite is present in the massive form of carnallite rock, it is disregarded as a potential resource by many potash exploration and development companies.

Nevertheless, the resource requires a re-examination, if only for the present high price of potash and the immense resource presently unexploited. A large part of the Saskatchewan potash and magnesium resource is "stranded" in that the technology to exploit the deposits remains to be designed and applied.

Key words: Carnallite, Carnallitite, Solution Mining, Saskatchewan Potash Deposits, Geology of Carnallitite, Geology of Sylvinitite

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