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Process Design and Economic Evaluation for the Recovery of Halite and Co-products from Lake Katwe Brine

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Abstract

Salt in Uganda is mainly imported from neighboring countries despite the existence of a 22.5 million t of mineral deposit at Lake Katwe, Western Uganda. Earlier attempts to extract salt from the deposit did not yield the required results. To reduce on the salt import bill and improve the livelihoods of the local miners, a modified solar concentration process was designed to extract sodium chloride and other evaporites. The process flow sheets describing the constituent unit operations were modeled using SuperPro Designer. A bench-scale experiment guided by thermodynamic calculations from the PHREEQC software was conducted to validate the process flow sheets. XRD results show that halite of > 99% purity was produced after the flotation of burkeite and trona. Furthermore, soda ash and sodium

sulfate were produced after the second evaporation process by a combination of flotation, carbonation, and calcination techniques. Sodium chloride is the most abundant and feasible product. The unit production cost of sodium chloride was 0.2629 and 0.4724$/kg with a net present value of $2,447,853 and – 12,085,796 of the solar salt and mechanical evaporation processes respectively. As a result, the solar salt extraction process proved highly feasible from both engineering and economic standpoints and thus can be scaled up to a pilot scale using conventional industrial equipment.

References

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