

Upgrading Bitumen using Molten Sodium Enabling Cost Effective Upgrading at Modest Scale

John Gordon ¹, Javier Avare ¹, Neil Camarta ²,

¹ *Ceramatec Inc., Salt Lake City, UT*; ² *Western Hydrogen, Calgary, AB*

Molten Sodium Upgrading (MSU) is a new breakthrough technology for upgrading bitumen economically at a “field upgrading” scale – producing an upgraded product that can be shipped by pipeline without adding diluent. Upgrading bitumen with molten sodium shows considerable promise at the laboratory scale. Metallic sodium reacts with a variety of feedstocks including Athabasca bitumen to reduce sulfur, metals and TAN to very low levels, resid fraction typically is reduced by more than half. API gravity rises primarily due to removal of sulfur rather than carbon rejection or hydrogen addition so coking is unnecessary and hydrogen requirements are small; olefin formation is negligible. Thus there is no need for a large coker or large steam methane reformer. Capital estimates to upgrade at the 25,000 bpd level are about half the levels expected for very large upgraders which are difficult to scale down effectively. Sodium upgrading is enabled by on site electrolytic regeneration conducted at modest temperatures using conductive ceramic membranes. The electrolysis cells are modular and generate sodium as needed at one electrode and molten sulfur at the other. Neither hydrogen sulfide nor sulfur dioxide are formed in the process so no sulfur species are emitted. This paper briefly will describe the technology, progress to date, and project the path toward commercialization.