

# Factors Affecting Current Efficiency of Hall-Héroult Process Based on the Variation of Sodium Content in Pot Metal

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## Abstract

Sodium concentration in pot metal is known to be an indicator of current efficiency. When current is present, the NaF gradient increases at the bath-metal interface. As the bath ratio at the bath-metal interface is consequently much higher than in the bulk, a film of crystallized cryolite may form. Factors affecting the integrity of this film, and thus the sodium content in metal, are documented in the present study. The cathode concentration overvoltage was calculated using the sodium concentration in the metal. The correlation between sodium and calcium in the metal was confirmed in agreement with thermodynamics. The correlation between the sodium concentration and several bath impurities in the metal was also investigated.

**Keywords:** Hall-Héroult process; current efficiency; sodium impurities in pot liquid aluminum; cathode overvoltage.