

Properties of Lithium Modified Baths for Hall-Héroult Cells

Asbjørn Solheim

Chief Scientist

SINTEF Materials and Chemistry, Trondheim, Norway

Corresponding author: asbjorn.solheim@sintef.no

Abstract

Some aspects concerning the use of lithium-modified baths in aluminium electrolysis cells were considered. Based on literature data, a number of physical and chemical properties were calculated for two cases: i) the bath composition was assumed to follow a liquidus temperature isotherm by adding lithium while at the same time reducing the amount of excess aluminium fluoride, or: ii) the bath was modified by adding lithium fluoride while keeping the amount of excess aluminium fluoride constant. Compared with normal bath compositions, lithium modified baths have higher electrical conductivity, lower alumina solubility, lower vapour pressure, higher density, higher viscosity, and higher surface tension. The current efficiency decreases when the composition follows a liquidus isotherm, but increases when lithium fluoride is added at constant aluminium fluoride. The main way for lithium out of the process is with produced bath. Using alumina containing 0.4 wt% sodium oxide and 0.04 wt% calcium oxide, the stationary consumption of lithium carbonate was estimated to be 0.32 kg/t Al.

Keywords: Electrolyte; lithium fluoride; physical data; current efficiency.