

## From the Lab to Technical Scale—Aluminum Electroplating from Ionic Liquids

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Room temperature chloroaluminate ionic liquids can be considered a viable alternative to organic solvent-based alkyl-aluminum electrolytes for the commercial electroplating of aluminum [1]. The development of chloroaluminate ionic liquid electrolytes was initially aimed at surface finishing [2], mainly for corrosion protection of steel. The properties of various combinations of Lewis acidic aluminum halogenides and Lewis basic organic halogenide salts have been established in numerous studies and the reaction mechanism of aluminum electrodeposition and dissolution has been explored, also by modeling [3]. In order to compete with the established SIGAL process [4], various aspects regarding the properties of the electroplated aluminum layers as well as practical issues of the plating process from chloroaluminate ionic liquids have to be addressed. Keeping in mind that the Lewis acidity of the electrolyte on the cathode surface has to be maintained, the limiting current can be maximized by adjusting the viscosity through co-solvents or temperature and by agitation of the bath. However, co-solvents as well as increased temperature might compromise the electrolyte stability [5]. Additives can be used as levelers, grain refiners, and/or brighteners. However, the highly reactive Lewis acidic mixture can severely limit their persistence and efficiency [6]. The pre- and post-treatment of the surface must be compatible with the water sensitive electrolyte in order to maximize the layer quality. These and further issues such as drag-out loss, bath maintenance, recycling, and disposal, all relevant for a scale-up of the process, will be discussed.

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