

Scale Formation in Alumina Refineries

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Abstract

Scales, in general, form due to the transport of the components from the bulk of the liquid phase to the walls of pipes and/or equipment. The liquid phase velocity at the walls, in the boundary layer, is practically zero, allowing the constituents to reach their equilibrium solubility. The species which are most important to scale formation are the intermediate compounds of consecutive reactions. This theoretical scheme describes the formation of desilication product (DSP), titania compounds and boehmite scales in the digester systems, gibbsite scale in clarification and bauxite residue washing, and in the “white side” of alumina refineries. Bauxite and/or bauxite residue particles can be trapped in scale. The study of the elements of scales has proven a useful tool in the understanding of titanium and iron mineral reactions. Chemical and mineralogical analyses of digestion scales from various alumina refineries are presented to support the theoretical considerations.

Keywords: alumina refinery scales; pipe incrustations; DSP, boehmite and gibbsite scale; titanium compounds.