

Influence of Alloying Element and Conversion Coating Variations on the Corrosion Properties of Recycled Al-Mg-Si Alloys

Alexander LUTZ¹, Iris DE GRAEVE¹

¹ *Group of Electrochemical and Surface Engineering, Department of Materials and Chemistry, Vrije Universiteit Brussel, Belgium*

The desire and necessity to reuse waste keeps growing. When scrap metals are used as resource challenges arise due to unprecedented material mixtures, because perfect separation is practically impossible. In 6xxx (AlMgSi) Aluminium scrap the main increased alloying elements are iron, zinc and copper. All three elements are known to be a possible source of quality issues in extruded 6xxx Al alloys: Fe can make anodized products look darker, Zn can give a spangling appearance after alkaline etching and Cu can make the material prone to different kinds of corrosion. Until a few years ago, the effects were mainly investigated for each element independently. Recently, it was shown that Cu can counteract the spangling effect of Zn by forming grain boundary precipitates.

In this work, we will present the effects of equal amounts of Zn and Cu on the corrosion properties of extruded 6060 Al alloys. The study contains electrochemical potential measurements of samples with different Zn, Cu composition during the various steps of pretreatment. The surfaces are analysed by optical and electron microscopy, XPS and Auger electron spectroscopy. This way the effects of the increased amounts of alloying elements can be compared to the various pretreatments especially the etching process and the formation of the conversion layer in dipping setups. Finally, the results allow to re-define the limits of Zn and Cu towards a higher amount of recycling content in the products and a more ecologically handling of the available resources.