ALTERNATIVE ANODISING PROCESSES FOR ALUMINIUM AND 2024 ALUMINIUM ALLOY

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Abstract

The aim of this work is to show progresses reached with an alternative anodising process for aluminium and aluminium alloys, based in sulphuric/boric baths, under different operating conditions. Traditional processes of chromic acid anodising and sulphuric acid anodising were used as reference.

The corrosion resistance of the anodised materials was determined by electrochemical impedance spectroscopy and outdoor exposure. The present results show that a good protection is achieved with the sulphuric/boric process.

The structure of the oxide films formed on AA2024 with the different anodising processes and its dependence on the anodising and sealing parameters were investigated by scanning electron microscopy and transmission electron microscopy and compared in order to interpret their corrosion performance. The films formed on commercial aluminium using the same anodising conditions were also investigated, as a way for assessing the influence of the alloying elements.

Photoelectrochemical spectroscopy and capacitance measurements were used to assess the electronic properties of anodic oxide films formed by the different processes, in order to obtain information on the electronic structure of these films. The results obtained indicate that the oxide films formed on aluminium show a semiconductive behaviour, with bandgap energies that are identical for the oxides studied, despite their different characteristics. Moreover, from the capacitance measurements performed on commercial aluminium it is possible to ascribe an n-type semiconductive behaviour, in accordance to the literature.

It was found out that capacitance measurements may be used as a valuable technique for the assessment of the quality of anodised layers, allowing the distinction between an efficient and an inefficient sealing. Therefore, they may be used to predict the corrosion resistance of these materials.