

Influence of microstructure and heat treatment on corrosion in new low-lead and lead-free brass alloys

Abstract

In new low-lead and lead-free brass alloys, it is not understood how the corrosion properties, such as dezincification, are related to material composition as well as annealing temperature and duration. This study aims to fill this knowledge gap by mapping sixteen annealing conditions within the temperature range 250°C – 400°C and three different brass alloy compositions to their respective microstructure and dezincification performance. The three investigated alloys were CW511, CW625 and CW626. It was found that high dezincification depth was a result of precipitation of intermetallic AIAs-particles along grain boundaries, twins and lead particles as well as precipitation of β -phase along grain boundaries. The precipitations of these phases were promoted by annealing temperatures within 300°C – 400°C, especially for extended annealing durations. The alloys with high micro additions of aluminium or iron were the most susceptible to this dezincification attack. In addition, it was discovered that the alloy with high aluminium content and low copper/zinc-ratio exhibited higher amount of β -phase, thus emphasizing the role of the copper/zinc-ratio in the corrosion resistance of brass alloys.

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