Corrosion Behavior of Al-Cu-RE(Re= La, Ce) Alloy Joints in Alkaline Soil Extract

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The corrosion behavior of metal inert-gas (MIG) welded Al-Cu-RE alloy joint in alkaline soil extract was studied by immersion corrosion test and electrochemical test. The microstructure, surface potential, corrosion morphology and corrosion products were analyzed by metallographic microscope, scanning Kelvin Probe (SKP), 3D optical profiler, scanning electron microscope (SEM) combined with energy dispersive spectrometry (EDS). The corrosion of the welded Al-Cu-RE alloy joint is mainly related to the difference of microstructure and surface potential in each region of the joint. The surface potential of the weld zone (WZ) was significantly lower than that of both the base metal (BM) and the heat affected zone (HAZ). The copper atom segregates near the fusion line (FL) and the noble second phase concentrates at the grain boundary of columnar crystal. As a result, the weld zone had the worst corrosion resistance with the most serious corrosion of the columnar crystal zone. The corrosion characteristics were pitting corrosion and local exfoliation corrosion. The corrosion products were mainly aluminum oxides and sulfides.

Keywords: Al-Cu-RE alloy; welded joints; electrochemical; SKP; pitting corrosion

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