

Corrosion behavior of friction stir welded lap joints of AA6061-T6 aluminum alloy

ABSTRACT

In this work, the corrosion behaviors of friction-stir lap welding of 6061-T6 Al-alloy are studied. The friction-stir lap welding was performed under different welding conditions (rotation speed and welding speed). The corrosion behavior of the parent alloy, the weld nugget zone (WNZ), and the heat affected zone (HAZ) of each welded sample working as an electrode, were investigated by the Tafel polarization test in 3.5 wt. (%) NaCl at ambient temperature. The morphology of the corroded surface of each region was analyzed by scanning electron microscopy together with energy dispersive spectroscopy (SEM-EDS). The results showed that the corrosion resistance of the parent alloy was better than the WNZ and the HAZ in both welding conditions. Localized pit dissolution and intergranular corrosion were the dominant corrosion types observed in the parent alloy, WNZ, and HAZ. The parent alloy, WNZ, and HAZ exhibited similar corrosion potentials (E_{corr}) after T6 heat treatment. This treatment had a better effect on the corrosion resistance of the welded regions than the parent alloy.

Keyword: Friction stir lap welding; Aluminum alloy; Tafel polarization; Intergranular corrosion; Localized pit dissolution