The effect of welding parameters on the corrosion behaviour of friction stir welded AA2024-T351

The effect of welding parameters (rotation speed and travel speed) on the corrosion behaviour of friction stir welds in the high strength aluminium alloy AA2024-T351 was investigated. It was found that rotation speed plays a major role in controlling the location of corrosion attack. Localised intergranular attack was observed in the nugget region for low rotation speed welds, whereas for higher rotation speed welds, attack occurred predominantly in the heat-affected zone. The increase in anodic reactivity in the weld zone was due to the sensitisation of the grain boundaries leading to intergranular attack. Enhancement of cathodic reactivity was also found in the nugget as a result of the precipitation of S-phase. The results were compared with samples of AA2024-T351 that had been heat treated to simulate the thermal cycle associated with welding, and with samples that had been exposed to high temperatures for extended periods to cause significant over-ageing.