

# **Investigations of corrosion resistance and mechanical characterization of TIG welded aluminum alloy 2219**

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## **Abstract**

In this study the effect of different electrode materials on the quality of commercial aluminum alloy AA2219 weldments and their susceptibility to corrosion were studied. The square butt joints were welded with AA2319, AA4047 and AlCuMg5 filler metals using GTAW method. The weldments were characterized using visual inspection, bend test for its soundness and subjected to tensile testing and metallographic studies for its mechanical properties and structure variations. To access its corrosion behavior Potentiostat techniques including Tafel Scan and Cyclic Polarization Test were carried out in pure water and 3.5% NaCl solution to determine the effect of environment on corrosion rate and pitting resistance respectively.

The results showed that the samples with filler metal AlCuMg5% were failed during welding due to presence of magnesium in the filler despite of good weldability of the base metal while the samples with filler metals AA2319 and AA4047 were found to be sound in visual inspection as well as in bend tests. The weldments with AA2319 filler showed higher mechanical properties than that of samples with AA4047 filler. The metallographic study showed similarity in both in base metal and heat affected zone but diversity both in grain size and structure due to variation in composition of the filler metal. The Tafel scan using Potentiostat technique showed higher corrosion rates for heat affected zone and weld zone in samples with AA2319 filler metal in both plain water and 3.5%NaCl solution, while the weld zone in samples with AA4017 filler metal showed resistance to corrosion as compared to base metal and heat affected zone, may be due variation in composition. However, the cyclic polarization data showed pitting tendency of all the weldments in all three regions in each environment despite of the composition variation of the filler metal.

## **Keywords**

Corrosion, Welding, Mechanical Properties.

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