

## ABSTRACT

Friction welding method is one of the most simple, economical and highly productive methods in joining similar and dissimilar metals. It is widely used in the automotive, aircraft and aerospace industrial applications. For many applications it is often necessary to join ceramic to metal to make the finished part. Ceramic-metal bonding is one of the biggest challenges that have faced manufacturers and users over the years because of the inherent differences in the thermal expansion coefficients of the two types of materials. In the present work, a ceramic composite of Al<sub>2</sub>O<sub>3</sub> – YSZ was friction welded to 6061 Al alloy. Alumina rods containing 0 and 25 wt. % Ytria stabilized zirconia were fabricated by slip casting in plaster of Paris molds and subsequently sintered at 1600°C. On the hand, the aluminum rods were machine down using a lathe machine to the dimension required. The diameters of the ceramic and metal rods were both 15 mm respectively. Rotational speeds for friction welding were between 900 to 2500 rpm. A friction pressure was maintained at 7 MPa and friction time was kept constant. The mechanical properties of the friction welded Al<sub>2</sub>O<sub>3</sub> – YSZ to 6061 alloy were determined with a 4 - point bend test and Vickers microhardness. The experimental results indicate that the mechanical strength of friction- welded Al<sub>2</sub>O<sub>3</sub> – YSZ /6061 Al alloy components were obviously affected by joining rotational speed selected.

**Keywords:** Friction Welding; Mechanical properties; Ceramic; Alumina; Zirconia; Aluminum; Alloy; 6061.