

**Frictions welding of TiAl6V4 tube to AA6061-T651 tube plate using an external tool
- A Study**

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ABSTRACT

Highest performance and concurrent weight and cost reduction become more and more important in aviation industry. There are different approaches to meet these demands. It is well known, for example, that welding of skin-stringer joints is progressively replacing riveted fuselage structures. Another very effective possibility is the implementation of hybrid structures; components made of different materials can be tailored to the local needs. As an implication there is need for a welding method allowing for joining dissimilar materials, such as titanium (corrosive properties, strength) and aluminium (low weight, low cost). However, joining of Al alloy to Ti alloy is difficult due to the formation of excessive intermetallic compounds at interface region of the joints by traditional fusion welding method. Excessive intermetallic compounds at the interface will make the joint brittle thereby reducing the weld strength. Friction Welding of Tube to Tube Plate using an External Tool (FWTPET) is an innovative process which has been successfully used to join tube and tube plate of different materials and has potential industrial applications. FWTPET-clearance method has been established to join 6mm thick aluminium (AA6061-T651) tube plate to titanium (TiAl6V4) tubes of 2.5mm wall thickness. Since heat generated at interface is lesser compared to conventional welding processes, intermetallic formation will be minimized and better joint strength can be obtained. Different tube profiles were used for welding and feasibility of joint was studied. XRD analysis showed TiAl_3 intermetallic at the weld interface. Fractograph at the shear fractured surface showed cleavage facets. Shear strength of the joint reached 60% of AA6061-T651 base material strength.

Keywords: Dissimilar welding; FWTPET; Intermetallic compounds ;Shear strength;
AA6061-T651

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