

Advances in Solid State Joining of High Temperature Alloys

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Many of the metals used in the oil and gas industry are difficult to fusion weld including Titanium and its alloys. Solid state joining processes are being pursued as an alternative process to produce robust structures more amenable to high pressure applications. Various solid state joining processes include friction stir welding (FSW) and a patented modification termed thermal stir welding (TSW). The configuration of TSWing utilizes an induction coil to preheat the material minimizing the burden on the weld tool extending its life. This provides the ability to precisely select and control the temperature to avoid detrimental changes to the microstructure.

The work presented in this presentation investigates the feasibility of joining various titanium alloys using the solid state welding processes of FSW and TSW. Process descriptions and attributes of each weld process will be presented. Weld process set-up and welding techniques will be discussed leading to the challenges experienced. Mechanical property data will also be presented.

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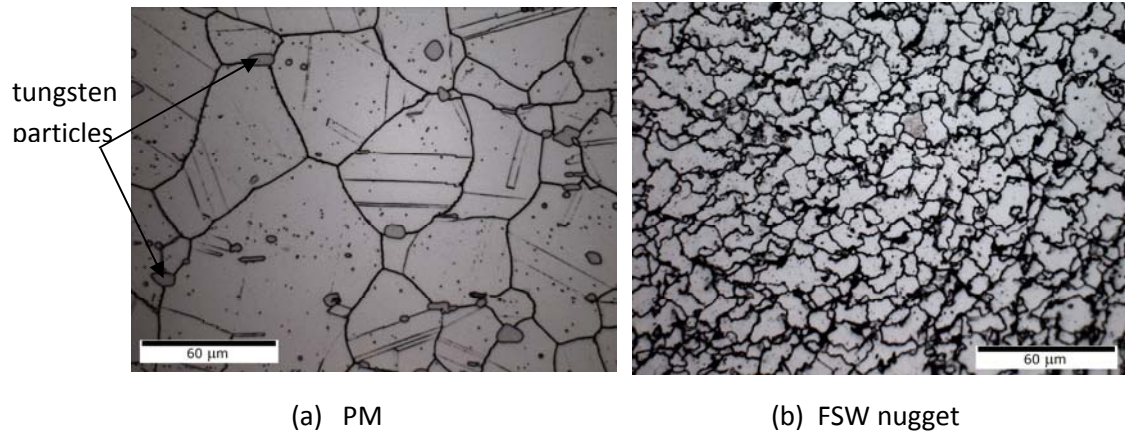


Figure 1. Grain refinement observed in PM (a) after FSWing of Haynes 230 (b).

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