

FRICION STIR PROCESSING OF MATERIALS: TOOLS DESIGN AND MICROSTRUCTURAL CHARACTERIZATION

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ABSTRACT

Friction stir processing (FSP) is a new solid state processing technique that can locally eliminate casting defects and refine microstructures, thereby improving strength and ductility, increasing resistance to corrosion and fatigue, enhancing formability, and improving other properties. FSP can also produce fine-grained microstructures through the thickness to impart superplasticity. Essentially, FSP is a local thermomechanical metal working process that changes the local properties without influencing the properties of the bulk material.

The paper introduces the FSP fundamentals of the process and its parameters. The tools design diversity used for different materials, even for those having high melting temperatures as steel, stainless steel and Ni based alloys is presented. Experiments regarding the influence of the FSP main parameters (the tool rotational and advancing speed) on material flow pattern around the tool are also considered. The paper deals also with the microstructural characterization of different zone friction stir processed in materials such as aluminium alloys, titanium alloys and steels.

KEYWORDS: friction stir processing,, tool design, microstructural characterization

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