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Editorial

Recent Achievements in Rotary, Linear and Friction Stir Welding of Metals Alloys

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Rotary, linear, and friction stir welding of metal alloys are solid-state joining processes in which a joint between two metals can be formed by a combination of frictional heating and applied force. In fact, friction stir welding is fast becoming the process of choice for manufacturing lightweight transport structures and linear and rotary friction processes have been established as niche technologies in aero-engines and dissimilar metal circular parts, respectively. This Special Issue collects a sample of recent meaningful research from academic and industrial experts and researchers.

The papers in this Special Issue deal with the effect of frictional heating and applied force on the microstructure and mechanical properties of metals, numerical and analytical modeling, weld quality, and optimization. In more detail, the contributions have concerned the following topics.

The effect of cold rolling performed after friction stir welding (FSW) on the mechanical properties and formability of joints in AA5754-H114 aluminum alloy [1].

The microstructure evolution of the welded joints of AA6082-T6 obtained using the bobbin friction stir welding process with a focus on grain refinement [2].

The characteristic features of the entry and exit defects in the weld structure and formation mechanism of them during the BFSW process. The issue was investigated using stacked layers of multi-colored plasticine for the material flow detection [3].

The thermo-structural analysis of material behavior, material flow, and defect generation during the friction stir butt-welding of 5083-O sheets [4].

The characterization of the dissimilar friction stir weld of Ti-6242 S and Ti-54M in terms of microstructure, microhardness, fracture morphology, and material migrating from the retreating (RET) side to the advancing (ADV) one [5].

The characterization of the interface of friction stir lap welding joints of 6082-T6 aluminum alloy and Q235A steel [6].

The investigation of the microstructure evolution and properties response of a friction-stir-welded copper-chromium-zirconium alloy [7].

The study of the influence of the process parameters on the vertical force generated during friction stir welding of AA6082-T6 aluminum alloy sheet blanks [8].

The role of mechanical connection in friction stir keyholeless spot welding of AZ31B Mg alloy, Mg99.50, DP600, and non-zinc-coated DP600 lap welding [9].

The application of a fully coupled thermo-mechanical model together with an enhanced friction law for the simulation of an FSW process with a cylindrical threaded pin tool [10].

The identification of the chemical composition of etchant reagents for metallographic examination of the friction-stir welded A6082-T6 alloy [11].

The study of an advanced meshfree computational framework to be used for the determination of optimal process parameters for the friction stir welding of an AA6061-T6 butt joint [12].

The numerical modeling approach to the study of the linear friction welding of 30CrNiMo8 high strength steel Hero chain [13].

The development of a 3D coupled thermo-mechanical finite element model based on the coupled Eulerian Lagrangian method to predict and analyze defect formation during the friction stir welding of Al6061-T6 aluminum alloy plates [14].

The review and comparison of three different simulation methods of Lagrangian, Eulerian, and Arbitrary Lagrangian–Eulerian for the thermal modeling of the FSW [15].

The study of the influence of the main welding parameters on the formation of intermetallic compounds and defects in the friction stir welding of aluminum alloys and steels [16].

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