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Research Article

Prediction of Tensile Shear Fracture Load of Friction Stir Spot-Welded AA2024-T3/HCS Dissimilar Joints

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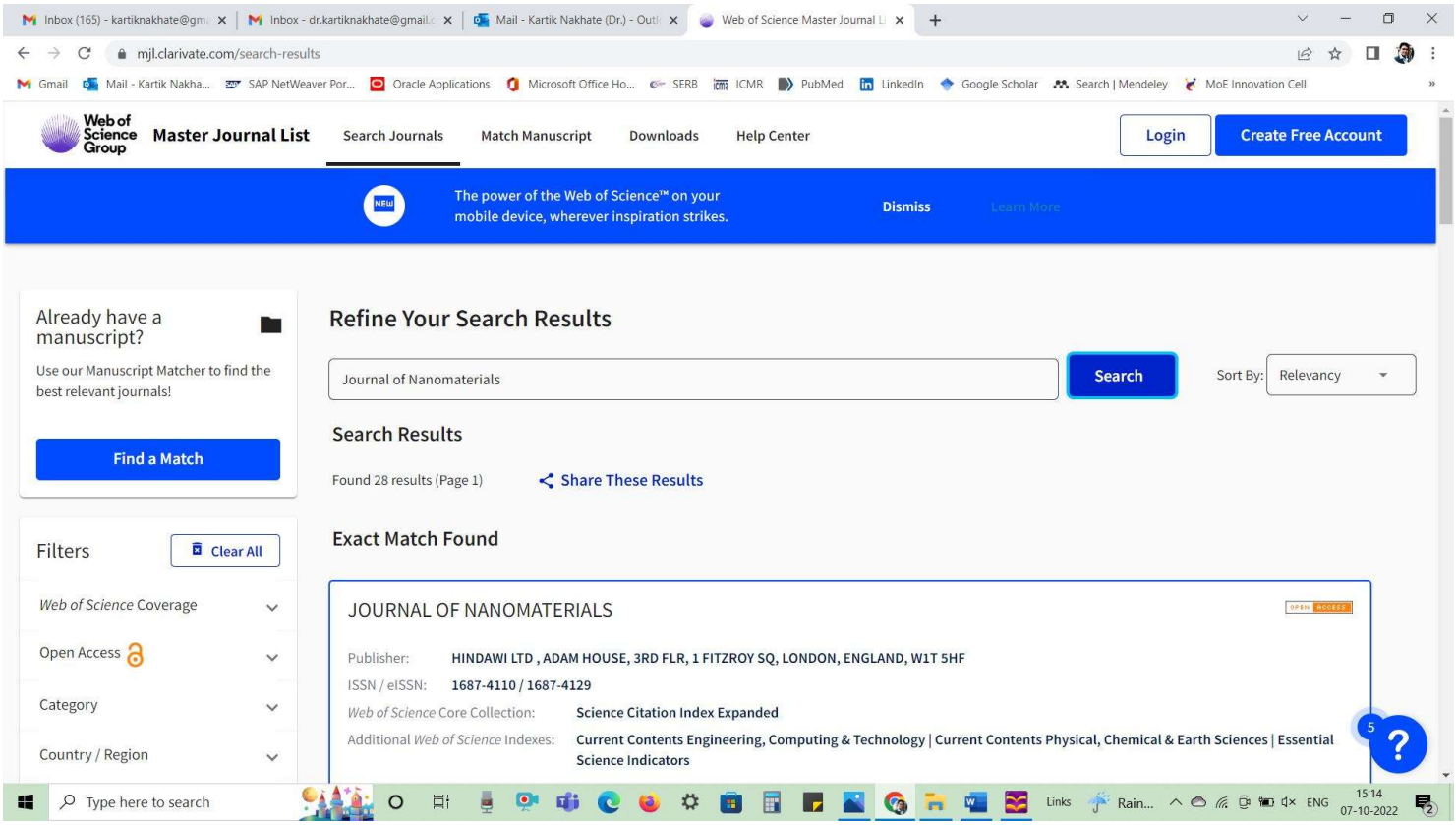
Lightweight materials play a vital role in many industries because of their weight reduction, corrosion resistance, and formability. On the other hand, joining this alloy is a very tedious process for everyone in industries due to incompatibility in metallurgical properties. The thick intermetallic formation, porosity, and segregation of alloys in the weld are the possible causes during welding of dissimilar materials by the fusion welding process. Nowadays, these materials have been joined by solid-state welding friction stir welding. AA2024 and high carbon steel (HCS) were used for friction stir spot welding in this investigation. Tool rotational speed, plunge rate, plunge depth, and dwell time were the major influencing process parameters. Design of experiments and response surface methodology were used to optimize the process parameters to attain maximum lap shear strength of AA2024/HCS.

1. Introduction

AA2024 and high carbon steel (HCS) are the most prevalent materials in heavy structural fabrication industries because of their availability, formability, machinability, etc. [1]; these two alloys are high-strength materials that possess unique properties like corrosion resistance, strength, and light-weight material [2]. The only problem with these materials is that joining materials is very difficult in the fusion welding process due to metallurgical incompatibility [3]. Hence, it is a significant challenge for welding and manufacturing engineers. Nowadays, these two alloys are welded using a solid-state welding process, friction stir welding (FSW). In some of the areas like fabrication, aircraft structure uses riveted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