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Friction Stir Vibration Welding of Al5052 Alloys

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Abstract: In the current research, a new method is applied to modify the conventional friction stir welding (FSW) process. Fixture, which fixes the workpieces, is shaken mechanically during FSW in a direction normal to weld line in order to increase the straining of weld region material. In other words, vibration of workpieces is accompanied by the rotating motion of tool. This new process can be described as friction stir vibration welding (FSVW). Al 5052 alloy specimens are welded by two welding methods, FSW and FSVW. Microstructure and mechanical properties of welded specimens are compared. Metallography analyses indicate that grain size decreases and hardness increases as FSVW method is applied. Tensile test results also show that strength and ductility values of friction stir vibration (FSV)- welded specimens are greater than those relating to friction stir (FS)-welded specimens. It is because of more work hardening of plasticized material, during FSVW, which leads to more generation and movement of dislocations. Correspondingly, grain size decreases and mechanical properties improve. Additionally, it is observed that the mechanical properties of the weld improve as vibration frequency increases.

Keywords: “Friction stir vibration welding”, “Solid-state welding”, “Mechanical properties”.