



*Proceedings of Iran International Aluminium Conference (IIAC2018)  
April 24-25, 2018, Tehran, I.R. Iran*

## **Modified Method to Enhance the Efficiency of Friction Stir Processing**

M. Abbasi<sup>1</sup>, B. Bagheri<sup>2\*</sup>, M. Givi<sup>1</sup>

1- Faculty of Engineering, University of Kashan, Kashan, Iran

2- Department of Mining and Metallurgy, Amirkabir University of Technology, Tehran, Iran.

**Abstract:** Friction stir processing (FSP) is a solid-state modification method to process the surface of metals. In this process, due to rotation and translation of a non-consumable tool, metal surface microstructure is refined and its mechanical characteristics improve. Different methods were applied to improve the efficiency of FSP. In this research, a new method entitled friction stir vibration processing (FSVP) was presented to enhance the efficiency of FSP. Metal workpiece was vibrated normal to processing line during FSP. Microstructure and mechanical properties of Al5052 alloy specimens processed using FSP and FSVP methods were analyzed. The results showed that grain size decreased as vibration was applied. It was also observed that yield and ultimate tensile strengths as well as hardness increased as FSVP was applied. This was related to enhanced straining of metal surface material as vibration was applied. The increase in straining enhances the dislocation density and consequently, due to dynamic recrystallization, more grain boundaries with high angle are developed. The results also showed that strength and ductility of FSV processed specimens increased as vibration frequency increased. This new method is advised for application in industry.

**Keywords:** “Friction stir processing”, “Vibration”, “Microstructure”, “Mechanical properties”.