



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

## **Microstructure and mechanical properties of Al1050/Al5052/SiC multilayered composite produced via accumulative roll bonding process**

M. Tayyebi<sup>1</sup>, D. Rahmatabadi<sup>2</sup>, R. Hashemi<sup>2</sup>

<sup>1</sup> Department of Materials Engineering, Sahand University of Technology, Tabriz 51978-17169, Iran

<sup>2</sup> School of Mechanical Engineering, Iran University of Science and Technology, Tehran, 16846-13114, Iran

**Abstract:** In this paper, the Al1050/Al5052/SiC multilayered composite is fabricated via ARB process. The microstructure and mechanical properties are studied by optical microscopy, scanning electron microscopy, microhardness measurements, and uniaxial tensile test. The microstructure images showed that plastic instability occurred for the Al5052 reinforcement at the 1<sup>th</sup> cycle and then by increasing the accumulation strain the Al5052 changed from the lamellar state to particle form, and at the last ARB cycle, a composite is prepared with an perfectly distribution of Al5052 and SiC reinforcements. At the initial ARB cycles, the thickness of the Al5052 layers decreased sharply and then by increasing the number of ARB cycle decreased due to work hardening of the layers. By increasing the number of ARB cycles, the microhardness of both Al1050 and Al5052 layers were significantly and continuously increased. The ultimate tensile strength of Al1050/Al5052/SiC multilayered composite at the initial sandwich up to the 2<sup>th</sup> cycle increased and then decreased in the 3<sup>th</sup> and 4<sup>th</sup> cycles, and finally increased in the last two cycles. The best mechanical properties were achieved in the final cycle and the maximum values of 14% and 326 MPa were obtained for elongation and tensile strength. This strength value is about 3.58 and 1.49 times higher than that of the initial Al1050 and Al5052, respectively. SEM images of the tensile fracture surfaces at the different ARB cycles, showed that by increasing the number of the ARB cycles, the fracture mechanism changed from ductile to shear ductile.

**Keywords:** ARB process, Al1050/Al5052/SiC composite, SiC particles, Microstructure and Mechanical properties