

## **Fracture behavior investigation of Al/Cu/Mg multi-layered composite produced by ARB process**

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**Abstract:** In this paper, for the first time, fracture behavior of multi-layered composite produced by accumulative roll

bonding (ARB) process was investigated. At first, Al/Cu/Mg multi-layered composite was prepared by ARB through seven passes, and the microstructure and mechanical properties were evaluated, and then the plane stress fracture toughness of Al/Cu/Mg were studied via R-curved. The results of microstructure investigations indicated that plastic instability occurred for the both Cu and Mg reinforcing at the primary sandwich and uniform distribution was processed. By increasing the number of ARB cycles, the microhardness of the three layers Al, Cu, and Mg and ultimate tensile strength (UTS) were significantly increased, continually, and UTS reaches to the maximum value of 355.5 MPa. Results of fracture test showed that by increasing the number of ARB cycles, the value of fracture toughness is increased, continually and at the third pass reaches to the maximum value of 40.4 MPam<sup>1/2</sup> that it is 4.08, 3.45 and 2.76 times higher than Al, Mg and Cu, respectively. Also, the trends of fracture toughness for Al/Cu/MG are in good agreement with the results of the fracture behavior investigation of Al 1050 produced by ARB.

**Keywords:** multi-layered composite, ARB process, fracture behaviour, mechanical properties and microstructure