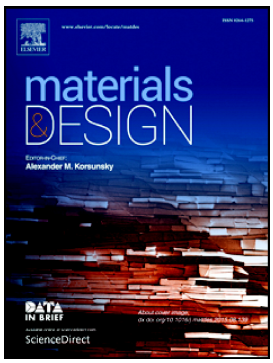

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Influence of intermetallic compounds on the electrical resistivity of architectured copper clad aluminum composites elaborated by a restacking drawing method

F. Moisy[a], A. Gueydan[a], X. Sauvage[b], A. Guillet[b], C. Keller[b], E.Guilmeau[a] and E. Hug[a]

[a]NormandieUniv, UNICAEN, ENSICAEN, CNRS, Laboratoire CRISMAT, 14050 Caen, France

[b]NormandieUniv, UNIROUEN, INSA Rouen, CNRS, Groupe de Physique des Matériaux, 76000 Rouen, France

Abstract

Architectured wires containing 61 restacked Copper Clad Aluminum (CCA) wires were cold-drawn down to a diameter of 1mm without intermediate annealing. Samples were taken at intermediate diameters of 3mm and 1.7mm to observe the wire structure at different steps. Independently of the wire diameter, the structure did not exhibit any porosity and initial CCA wires were uniformly distributed inside the structure with constant equivalent diameters. Post-elaboration annealing treatments performed on CCA and architectured wires led to the formation of Al_2Cu, AlCu and Al_4Cu_9 InterMetallic Compounds (IMC). It was shown that IMC growth kinetics do not depend on the wire diameter, indicating no marked influence of the plastic deformation. The volume fraction of IMC strongly increased with the reduction of the diameter and impacted the electrical resistivity of the architectured wire. The equivalent resistivity has been easily computed by a linear rule of mixture model, with three electrical resistances in parallel (Al, Cu and IMC), weighted by their respective volume fraction. This model allowed extracting a mean resistivity of IMCs of 4.5 μΩ.cm. It also demonstrated that this restacking drawing process, without any intermediate annealing treatment is an interesting method for the elaboration of architectured wires with optimized functional properties.