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Threshold Shear Stresses at Aluminum-Silicon interfaces[1] ALICE NOREYAN, University of Windsor, YUE QI, General Motors, VESSELIN STOILOV, University of Windsor — The critical shear stress (CSS) was determined using molecular dynamics and MEAM potential for various Al/Si interfaces with different alignments (normal to the interface) and orientations (parallel to the interface). It was found that the primary influence parameter for CSS was the general crystallographic alignment of the interface. For all Al/Si interfaces the fracture under shear is mostly localized within 10 Å in Al close to the interface. The critical shear stress of Al/Si interface is significantly lower than the critical tensile stress due to the partial stick-slip in sliding. In addition, there is not explicit relationship between shear and tensile critical stresses, which is dramatically different from isotropic materials, where the shear stress is about half of the tensile stress. The mis-orientation effects show great contrary in homogenous Al/Al interfaces and heterogeneous Al/Si interface: the mis-orientation can reduce the CSS at Al/Al interfaces by two orders of magnitude; while it has insignificant effect on CSS in Al/Si. Therefore, in general, introducing Si improves the strength of the interface (and the composite material in general) for different grain orientations.

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