EFFECT OF REINFORCEMENT PARTICLE FRACTURE ON THE
LOAD PARTITIONING IN AN AL-SIC COMPOSITE

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We studied load partitioning during tensile loading of a 7093 Al alloy reinforced with
15 volume percent SiC particles, by observing the evolution of phase stresses using in-situ neutron diffraction. Microscopic deformation and damage evaluation had indicated
that the dominant damage mechanism of the composite, during uniaxial tensile loading,
was reinforcement particle fracture, combined with matrix plasticity at locations of
particle cracks. In this study, changes in the load partitioning behavior were investigated
from the elastic and plastic regimes to high macro-strain regime where particle fracture
damage became significant. Anomalous load partitioning behavior was observed
beyond 3% applied strain, and this could not be explained simply from a particle
damage viewpoint. Rather, we propose that the anomalous load partitioning, a
seemingly reverse load transfer from the particles to the matrix, is associated with a
synergism of particle fracture and slip activity in the matrix, consistent with our
metallographic observations. Finite element analysis was conducted to shed insight into
the neutron diffraction data and on the microscopic deformation and damage
mechanisms leading to fracture of the composite.
1. Permission:

The abstract (Effect of reinforcement particle fracture on the load partitioning in an Al-SiC composite) may be posted on the DXC web site and other affiliated web sites.

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3. Preferences

Oral presentation.

Neutron Diffraction session organized by Prof. E. Ustundag.

I intend to publish this paper in Advances in X-ray Analysis, Volume 46.