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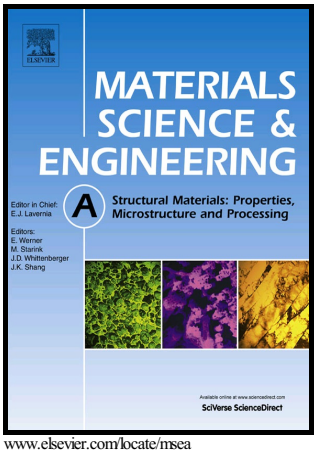

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Analysis of surface roughening behavior of 6063 aluminum alloy by tensile testing of a trapezoidal uniaxial specimen

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Abstract: To determine the quantitative relationship between surface roughness and strain, the surface roughening behavior of a 6063 aluminum alloy tube was examined by tensile testing of a trapezoidal uniaxial specimen, that can provide a continuous strain distribution after tensile deformation. The surface roughness was measured using a laser scanning confocal microscope to reflect the degree of roughening. The microstructure and surface morphology were examined using electron back-scattered diffraction and in-situ scanning electron microscopy to determine the grain orientation and surface topography evolution. The surface roughness increased with strain when the strain was less than 0.067 and then decreased slightly, with a maximum surface roughness of 23.73 μm. Inhomogeneous deformation at the grain boundaries and inside the grains was enhanced with increasing strain, resulting in an increase of surface roughness when the strain was below a critical value. As the strain increased, a greater number of slip systems contributed to the further deformation. Thus, the strain became more homogeneous, and accordingly, the surface roughness slightly decreased.

Keywords: 6063 aluminum alloy; Surface roughening; Deformation behavior; Microstructure; Tensile deformation[1]

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