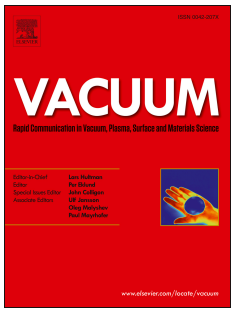

Gradient shear banding in a magnesium alloy induced by sliding friction treatment

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Gradient shear banding in a magnesium alloy induced by sliding friction treatment

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A peculiar shear band structure was reported in AZ31 treated by sliding friction treatment. The width and space of shear bands are both gradually increased from the surface to the matrix. This distribution is attributed to the gradually increased grain sizes and decreased strain rates with an increasing depth.

Keywords: Ultrafine-grained materials; Microstructure; Shear band; Magnesium; Surface nanocrystallization

Shear bands (SBs) are often viewed as a process foreboding of failure in metals under high strain rate loading, such as high-speed machining, dynamic compression and cylinder expansion tests [1-5]. In those processes, cracks nucleate and spread as a consequence of SB. Thus, the study on SB initiation, development and final distribution will provide essential insight on the failure mechanisms of such materials. The metals with uniform grain size (*d*) often present SB with the same width throughout the shear banding process [4-5].

Recently, materials with gradient grain size were developed by Lu et al. using surface nanocrystallization [6-8], in which *d* increases from the surface with nano-grains to the undeformed matrix with coarse grains. To our knowledge, the features of SB in these new materials have not yet been reported.