Response of shock wave deformation on the evolution of microstructure and texture in magnesium

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Magnesium (Mg) alloys are widely used in automotive and aerospace applications, due to the combined properties of light weight, high strength to weight ratio, and high specific stiffness, where they can be exposed to high strain rate situations such as car crash and ballistic impact. Therefore, it is very important to evaluate the effects of microstructure and texture on the dynamic mechanical response of magnesium under shock loading conditions. Moreover, shock induced deformation of materials is equivalent to high strain rate deformation and evolution of microstructure and texture after shock and high strain rate is different from conventional deformation. In present study, pure magnesium is unidirectionally rolled (90%) at elevated temperature, then annealed for 1hr at 350^{O}C and response of shock wave deformation on the evolution of microstructure and texture were investigated in detail. Fig.1 shows that formation of deformation twins, dislocations, and shear bands was observed in deformed microstructure. Additionally, weakening in texture and strain heterogeneities develops within the grain was also seen after shock induced deform material. Basal slip system has the lowest critical resolved shear stress (CRSS) therefore, basal slip and tension twinning of the $\{10\bar{1}2\}$ type are dominant deformation mechanism of Mg.

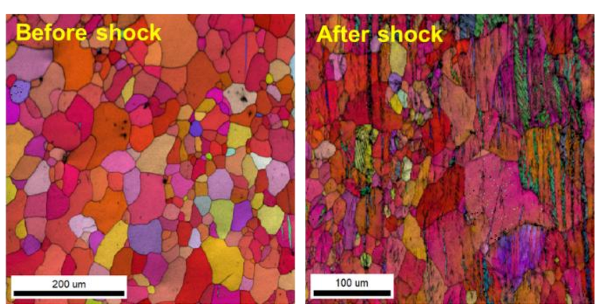

Fig.1 IQ+IPF maps of before and after shock deformed pure magnesium.

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