NANO HIGHLIGHT
NIRT/GOALI: Fundamental Study of Bulk Magnesium Alloy Matrix Nanocomposites Fabricated by Ultrasonic Cavitation Based Solidification Processing

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Magnesium alloys--one third lighter than an equal volume of aluminum alloys--are one of the lightest metallic structural materials and are very attractive for applications in automotive and aerospace systems. The need for complex structural components of high performance magnesium materials is tremendous.

Magnesium matrix nanocomposites were obtained by ultrasonic cavitation based dispersion of SiC nanoparticles in magnesium melts. About 2wt% SiC nanoparticles of two different sizes, 30nm and 50nm, were successfully added into the Mg melt. It was found that ultrasonic cavitation based dispersion of nanoparticles was very efficient to disperse the SiC nanoparticles uniformly. The mechanical properties of Mg were improved significantly by adding 2wt% SiC nanoparticles. With 2.0wt% 30-nm SiC particles, the ultimate tensile strength and yield strength increased 34% and 100% respectively. While with 2wt% 50-nm SiC particles, the ultimate tensile strength and yield strength increased 62% and 220%, respectively. Meanwhile, the ductility was retained in both cases. This study showed that ultrasonic cavitation based dispersion of nanoparticles was an innovative way for producing premium quality magnesium matrix nanocomposites for industrial applications. Fig.1 shows the morphology and distribution of SiC nanoparticles in the magnesium matrix. The curves of stress vs. strain for pure Mg and Mg/2% SiC composites were shown in Fig.2.

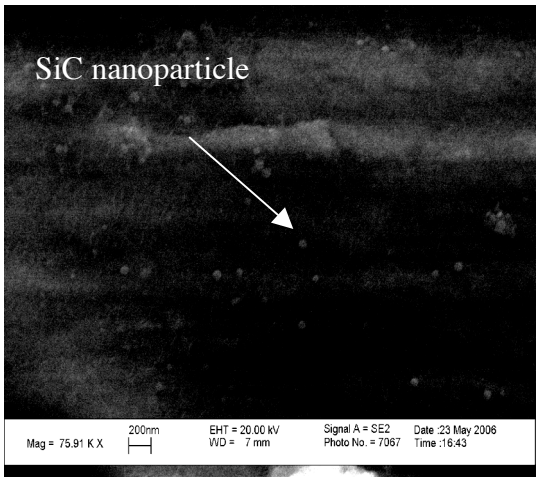

Fig.1. Mg/2% SiC nano composites

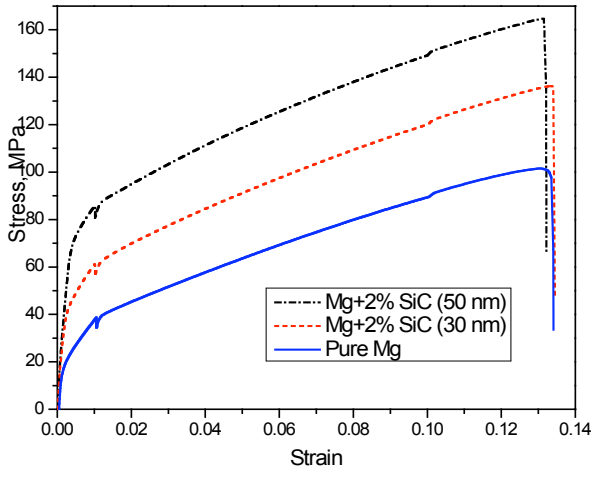

Fig.2. Tensile results