



University of Central Florida

Technology Available for Licensing

tt.research.ucf.edu

Simple Process for Magnesium-Based Metal Matrix Nanocomposite Production

Magnesium-based metal matrix nanocomposites (MMMNCs) were created to boost the mechanical properties of particle-reinforced metal matrix composites (MMCs) and to retain and reinforce ductility through employing nano-sized particles. Other processes, such as powder metallurgy, disintegrated melt deposition, ultrasonic cavitation based casting, and friction stir processing, have been utilized to manufacture MMMNCs, showing a great degree of dispersion and uniformity of the reinforcing nanoparticles and producing magnesium nanocomposites with < 1 vol% of ceramic nanoparticles. Unfortunately, these processes are complex, costly, and not as effective.

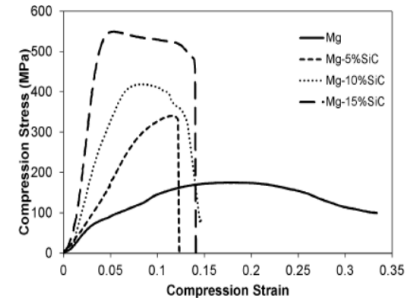
UCF researchers have created a unique and simple process that can be used to produce a unique bi-modal structured MMMNC with significantly improved mechanical properties that retain ductility. This technique includes sufficiently milling a powder mixture made of micrometer-size metal flakes and ceramic nanoparticles, and then embedding most of the ceramic nanoparticles into the metal flakes. Compared to using metals or metal alloys alone, this technique dramatically increases the stiffness and yield strength of the bimodal metal nanocomposite and retains the ductility of the metal or metal alloy. This process can be utilized in the production of airplane structures, vehicle armor, and automobiles.

Technical Details

Through the process of sintering, the microstructure of the bi-modal metal nanocomposite shows a first phase and a second phase. The first “hard” phase contains the ceramic nanoparticles in the metal or metal alloy matrix, while the second “soft” phase comprises only the metal or metal alloy with either few or no ceramic nanoparticles. Suitable metals or metal alloys include, but are not limited to, magnesium, aluminum, copper, iron, tin, titanium, and nickel.

UCF Inventors

Linan An, Ph.D.; Jinling Liu



Compression Stress-Strain Curves of Magnesium and MMMNCs

Benefits

- Increased ductility, stiffness, and yield strength

Applications

- Airplane structures
- Vehicle armor
- Automobiles

Tech Fields

Advanced Materials, Aerospace

Keywords

metal matrix nanocomposites, metal matrix composites, magnesium-based metal matrix nanocomposites, ductility

Patent Pending

If you or your company are interested in this opportunity, Contact:

Raju Nagaiah | 407.882.0593 | Raju@ucf.edu | Tech ID# 32869

UCF Office of Technology Transfer | 12201 Research Parkway, Suite 501, Orlando, FL 32826