Semi-Solid Forming of Metal-Matrix Nanocomposites

INVENTORS • Xiaochun Li, Lih-Sheng Turng, Michael DeCicco

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method of incorporating nanoparticles into a semi-solid casting process.

OVERVIEW

Semi-solid casting (SSC) is a high-integrity die casting technique, wherein metal is injected into a mold cavity in a semi-liquid/solid state with a “slushy” consistency. Semi-solid metal has lower energy demands and less porosity, is more easily handled and requires less post-molding machining than metal cast using high-pressure die casting; however, it is difficult to generate the globular microstructure (globular solid particles suspended in the remaining liquid phase) needed for SCC.

THE INVENTION

UW-Madison researchers have developed a method of incorporating nanoparticles into a semi-solid casting process, so the resulting metal-matrix nanocomposite has the appropriate globular microstructure and improved mechanical properties. The metal-matrix nanocomposite is formed by heating a metal until it reaches a liquid state and then adding nanoparticles to the liquid metal. To uniformly distribute the nanoparticles throughout the metal, the metal/nanoparticle mixture is agitated by inserting a probe that vibrates at ultrasonic frequencies into the mixture. The mixture can then be cooled, and the vibrating probe removed. When the mixture reaches a semi-solid state, it can be injected into a mold cavity for SCC.

APPLICATIONS

• Formation of aluminum, magnesium or titanium parts to replace heavier steel parts in the automotive industry

KEY BENEFITS

• Machine parts and other articles formed by this process have improved properties.

THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.
• Metal/nanoparticle mixture retains the globular microstructure needed for SSC after solidification begins
• Maintains all the advantages and efficiencies of SCC
• Use of ultrasonic vibration simplifies the preparation of material for SSC, saves significant time and energy and widens the SSC process window

ADDITIONAL INFORMATION

Tech Fields
Materials & Chemicals - Metals
Materials & Chemicals - Nanocomposites

CONTACT INFORMATION

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842.