Inexpensive Room Temperature Synthesis of High Quality Zirconia Powders for Materials Applications

Zirconium is a well-known structural ceramic, which exhibits a resistance to wear, abrasion, impact fracturing, corrosion, an ability to withstand high temperatures, and other highly desirable mechanical properties. Zirconium is at its strongest when it is metastabilized in a tetragonal state. If a sufficient amount of metastable zirconium is present, it will convert to its monoclinic phase specifically at the site of a fracture. The conversion from the tetragonal to the monoclinic phase is associated with a volume expansion, which then compresses the fracture delaying the crack propagation and resisting subsequent fracture. In order to keep zirconium in its strongest tetragonal state at room temperature stabilizers must be incorporated. Traditional synthesis and stabilization methods are unable to produce zirconium in a 100% purely tetragonal phase, thereby reducing the chance the material will exhibit this “self healing” effect at the site of a fracture.

Technical Details

UCF scientists have discovered a method to generate such a material utilizing sol-gel techniques at room temperature. By incorporating this method materials manufacturers can produce zirconium of the highest quality for a significantly reduced price.

Benefits

• One-of-a-kind sol-gel method for creating 100% tetragonal phase nano and submicron sized zirconia powders at room temperatures
• Inexpensive
• Capable of producing high quality coatings at lower temperatures and in complex shapes

Applications

• Composites
• Catalyst supports
• Membranes
• Gas sensors
• Nanocrystalline ceramic coatings

Additional Technology Numbers: 31026, 31196, 31456

Technology #30025


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