
Zircon A Potential Alloy As Dental Ceramic Including Nano Zircon

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ABSTRACT

Zinc aluminum family alloy was found to be highly suitable ZA-27 alloy developed by the Canadian Organization of Naranda Mines Ltd is part of a new family of zinc based alloys having good castability, good mechanical properties in addition good bearing properties. Some of the popular reinforcement materials used in recent years includes silicon carbide, mica, zircon and graphite. In the present investigation (Ph.D thesis) ZA-27 alloy was used as the base matrix Materials. The metal matrix composites were prepared by keeping zircon constant at 2% by weight and varying gypsum from 0.6% to 1% by weight in steps of 0.2%. The cast composites were also subjected to deep cryogenic treatment at -196°C. Hardness, tensile properties, compression strength, wear resistance, machinability and microstructural studies were carried out both on cast composites as well as cryogenic treated composites. Hardness has been decreased with increase in gypsum content for both untreated and Cryo treated specimens. But deep Cryo treated composite exhibited marginally increased hardness. UTS (Ultimate tensile strength) have been decreased due to addition of gypsum to ZA- 27 alloy for both untreated and cryo treated composites. But deep cryo treated composite have marginally increased UTS. Percentage elongation increases with addition of gypsum for both untreated and cryo-treated composite. Marginally higher value of percentage elongation was observed in deep cryotreated composite. Compressive strength increases, with addition of gypsum in both untreated and cryotreated specimens. Slightly reduced compression strength was noticed in deep cryotreated composites. Wear resistance of ZA-27 alloy composites increases with increase of gypsum content. Deep cryogenic treatment results in better wear resistance compared to untreated composites. In Machinability test cutting force decreases with increase in gypsum content for untreated specimens. In cryogenic treated composites cutting force decreased marginally. Microstructure of untreated and cryotreated samples shows reinforcement particles distributed in the matrix in more or less uniform way. Thus in the present work metal matrix composites using ZA alloy as matrix material and zircon, gypsum as reinforcements has been successfully produced. Further composite so produced was subjected to deep cryogenic treatment. The evaluation of various properties has shown encouraging results which are quite useful. Zirconia (zircon) is an important material for both medical (dental) science and chemical industry. Zircon a kind of non-metallic material with desirable bio-compatibilities and corrosion resistance, as attracted significant interest among researchers and doctors. Especially its excellent mechanical properties are useful compared to other ceramics, which enables manufacturers to apply Zirconia widely in both medical and chemical industry. Zirconia is widely used to prepare all ceramic crowns or hard tissue implants, bearings and refractories etc. Of late nano-zircon, application of nano science or nano biotechnology carries much significance to overcome many disadvantages of ordinary material.

KEY WORDS

Zircon, Dental ceramic, Nano-Zircon, Biomedicine