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## Biocompatible nanocomposites with enhanced bone induction property

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Biomaterials are driving force in bone tissue engineering and orthopedics to mimic the nature. The major complication in biomaterials is mainly due to the mechanical property, bioactivity and osseointegration properties which limit their daily clinical practices result in high patient morbidity and mortality. In order to overcome the above, authors are focused on to potential composite materials rather than the single. Bioceramic composites, nano bioactive glasses (NBG) and metal doped hydroxyapatite (HAp) are the most promising biomaterial which exhibit excellent bioactivity and biocompatibility when interact with bone and tissue. We have synthesised titania-graphene nanocomposite employing simple *in-situ* sol-gel method. In addition, silica and phosphate based NBG powders with antibacterial agents like silver and zinc and HAp with metals such as Si and Zn were synthesized through sol-gel method. The characterization results confirm that the prepared biomaterials are in nano-sized with high mechanical and high surface area to volume ratio. The bioactivity of the above prepared nanocomposites is revealed through simulated body fluid. The exchange ions during the incubation period of bioactivity analysis and newly formed hydroxyapatite layer on implant surface confirm the bioactivity of the prepared nanocomposites. Moreover, the antimicrobial activity and cytotoxicity were analyzed respectively, in clinical pathogens and cell lines (human gastric adenocarcinoma (AGS), MG-63 and MC3T3). The specific zone of inhibition against the gram positive and gram negative microorganisms and non-significant cytotoxicity with percentage of cell viability of nanoparticles treated cell lines recommend the optimized concentration of prepared nanocomposite to the biomedical applications.

**Keywords:** Nanocomposite, titania-graphene, nano bioactive glass, hydroxyapatite, cytotoxicity and biocompatibility.

### Biography

V. Rajendran, FUSI, FASI, FInstP, is the Director, R&D, Centre for Nano Science and Technology, K.S. Rangasamy College of Technology, Tamil Nadu, India. He has more than 20 years of research experience and having to his credit, PI of 20 sponsored research projects with a fund of INR 323.8 lakhs. Under his able guidance, 11 scholars have completed their Ph.D. degrees. He has published more than 145 research papers, 28 referred books, 4 R&D books and 11 patents. He has won many awards including Prof. K. Arumugam National award in 2011 and Deutscher Academisher Austausch Dienst in 2002.

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## Strain induced melt activation (SIMA) of aa2014 alloy

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Strain induced melt activation (SIMA) is one of the semi-solid processing technologies performed for many aluminium wrought alloys. In the SIMA process, an alloy is subjected to cold working so as to induce stored energy and heated to temperature region between the solidus and liquidus temperatures. At this temperature recovery and recrystallization occur before liquid formation with the aid of the stored energy. Reaching the mushy zone, liquid is formed by preferential melting at grain boundaries with high energy state, and penetrates into high angle boundaries of recrystallized grains. The amount of stored energy and its distribution is the most critical factor in controlling the recovery, recrystallization kinetics and the uniformity of the resultant microstructure. The present paper essentially deals with different plastic deformations adopted on AA2014 alloy to achieve uniform refined and equi-axed globular microstructure that would result in to enhancement of properties like resistant to wear (abrasion, friction, erosion and corrosion). The alloy was cold forged and heat treated to semi solid temperature and then subjected to Microstructural analysis. Conclusions were drawn basing on the results obtained.

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