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A STUDY ON THE PREPARATION AND PHYSICO-CHEMICAL PROPERTIES OF SILICA NANOTUBE REINFORCED SILICA/APATITE NANOCOMPOSITE

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One of the most important objectives in the biomedical science is the development of new material as bone substitutes. Silica substituted nano-hydroxyapatite have gained considerable interest as bioceramic due to its remarkable bioactivity and osseointegrative properties. These properties favor the increased rate of bio-mineralization (forming of new apatite layer) and osteointegration, this is because silica-apatite interchanges Ca^{2+} ions with protons with the surrounding body fluid, which gives rise the formation of Si-OH groups that induce the apatite nucleation, this unique property of this material enhances the healing rate of defects or damaged bone. Here lies the interest of using silica based ceramic material as a candidate material for orthopedics. However the biomedical application of silica - apatite as bioceramic is limited due to its poor mechanical property under physiological conditions. Hence, it becomes necessary to improve the mechanical property of silica- apatite for load-bearing applications. A number of methods have been devised to improve the mechanical properties of brittle ceramics. The most suitable approach to improve the mechanical strength, without diminishing its bioactivity is to incorporate nano fillers as reinforcing agents. Here an attempt was made to use inorganic nanotube such as silica nanotubes owing to its high aspect ratio, small dimensions and similar mechanical properties as bulk silica. In this study silica nano-hydroxyapatite was synthesised using hydrothermal technique in the presence of surfactants. Silica nanotubes were synthesised by adopting micro-emulsion technique. Silica-apatite was chemically reinforced with silica nanotubes, the developed nano composite was characterized for its physico-chemical properties.