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Abstract

Synthesis of Light Curing Nanocomposite Resins Filled with Surface Modified TiO2 Nanoparticles and Their Characterizations

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Abstract:

The aim of this study is to synthesize nanoTiO2 fillers for use in the fabrication of experimental dental nano-composites and to evaluate their properties, including surface and mechanical properties. Modern contemporary dentistry has changed drastically in restorative solutions with introduction of resins resulting in ebbing out of silver amalgam. In the evolution of composite materials, their fillers changed fundamentally and led to introducing nano-composites. As an inorganic additive of resin composites, TiO2 has many promising properties. TiO2 nanoparticle-reinforced dental resin composites are found to possess improved micro hardness and flexural strength. The conjugation of bisphenol A glycidyl methacrylate (Bis-GMA) onto the surface of nanoTiO2 contributed to improvement in miscibility between nano-filler and matrix, because the reactive C=C group of GMA participated in curing of the matrix, and hence resulted in the enhancement of mechanical properties. For improving the nanoparticle dispersion and increasing possible interactions between nanoparticles and methacrylate matrix, the surface of the nanoparticles was modified with aminopropyltriethoxysilane (APTES) silane coupling agent. The surface modification of nanoparticles was confirmed by SEM, TEM and FTIR. The functionalized nanoparticles were then inscribed in 0, 1 and 2 weight percentages into resin matrix. The tensile strength of final material was improved by more than 100% upon addition of 2 wt% of modified TiO2 nanoparticles as compared to neat resin matrix. The composite coatings also have good resistance towards various bacterial and fungal stains as compared to unfilled material. The coatings substantially gain hydrophilic nature symbiotically with TiO2 content suggesting its potential application as self-cleanable material. TiO2 nanoparticles are derived from a plant extract and possess the above properties. This green synthesis of nanoparticles is done by using microwave technique instead of using conventional time consuming techniques.

The flexural strength and modulus of the nano-composite resin is increased by 20- 30% as compared to the resin without nano-fillers.

Biography:

Rajesh Dashaputra completedhis Bachelor of Dentistry (B.D.S.) from University of Mumbai in 1985. He has trained in implantology very early when implants were introduced in India and joinedas member of ICOI(International Congress of Oral Implantologists) since 1995. He has been working in prestigious research institution of BARC under the dept. of Atomic Energy, govt. of INDIA for more than 23 years as a busy consultant dental implant surgeon with full use of digital technologies including CT and CAD CAM. He now has mastered and conducted more than 16 implant systems and mentors for few of the leaders. He also completed PGDM in Clinical Research with specialisation in CDM (clinical data management). He has furtherpioneered in another area of interest- healthcare informatics. He is fully trains students in implantology, computer guided solutions in dental treatments, healthcare software systems and telemedicine. He regularly speaks at international events and also has many publications including prestigious IJME (Indian journal of medical Ethics)? Canadian dialogue (due) and JDHODT and involved in stem cell and biomaterials research.

Publication of speakers:

1. Rajesh Dashaputra, Nanocomposites and their use in Dentistry, Dental Applications of Nanotechnology, August 2018, DOI: 10.1007/978-3-319-97634-1_4

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