Processing and characterization of nanostructured biocidal composite material for odontological application

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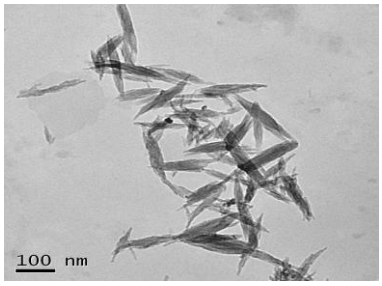
A biomaterial is constituted of a polymeric matrix (Bis-GMA e TEGDMA) with silver-doped glass and nanopowders of Hydroxyapatite and monoclinic Zirconia obtained by precipitation and hydrothermal routes, respectively, at the Università degli studi di Modena e Reggio Emilia. The sol-gel technique has been used to synthesize biocidal glass in order to define a composition that optimizes the bactericidal properties to at least 90% of efficiency.

The micrographs below display the morphology and size of each nanopowder.



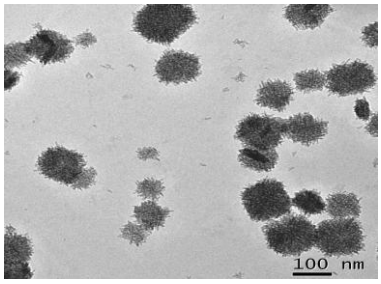


Fig. 1 and 2: Electron micrographs (TEM) of HAp and ZrO_2, respectively.

An ideal concentration of nanoparticles has been defined based on 3-points flexural and microhardness Knoop tests from 10 to 60% of HAp or ZrO_2. Then, the glass was incorporated into the composites already containing the selected concentration of both ceramics, separately, to be eventually tested by physical, mechanical and biological tests.

The results of the analysis have shown an optimum concentration of bioglass and ceramics of 10%. Increasing the percentage of ceramics, the aggregation was intensified. New synthesis techniques consisting of morphology and crystallinity control are under way to minimize this phenomenon.

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