NOVEL HYDROTHERMAL SOLUTION PROCESSING, CHARACTERIZATION AND BIOACTIVITY OF SOME SELECTED BIOMATERIALS

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Novel hydrothermal solution processing is one of the most powerful preparative chemistry routes for the synthesis of biomaterials particularly, hydroxyapatite and magnetite with desired properties. This process covers a wide variation with the use of aqueous, non-aqueous solvents, biomolecules, organic cappings, chelates and surface modifiers, especially very effective in the synthesis of biomaterials. These additives would enhance the reaction kinetics and also significantly reduce the processing temperature and pressure conditions even for the high melting compounds. Besides, the progress achieved in the understanding of hydrothermal solution chemistry, and thermochemical computation has significantly contributed to the processing of these materials. In this paper, the authors present the novel hydrothermal processing of hydroxyapatite and magnetite nanomaterials with controlled size, shape and surface chemistry. Both the compounds have exceptional biological applications. A series of novel solvents and organic additives will be discussed in the present work. The hydrothermal experiments were carried out within a wide range of temperature from 100 to 240 ^{o}C with autogeneous pressure. Several surface modifiers like oleic acid, oleylamine are used, and chelates like citric acid, and organic additives like glucose, gelatin, etc. have been tested with respect to the changes in the surface chemistry, size and shape of these nanomaterials, especially on magnetite nanoparticles. Similarly selective doping has been carried out to alter the biological activity in both hydroxyapatite and magentite. The nanomaterials processed were characterized by various techniques like powder XRD, FTIR, Laser Raman, SEM, DLS, BET surface area, etc. The biological activity has been investigated for these resultant materials and the effect of process parameters. An appropriate polymer like poly(methacrylic acid) (PMAA) and ethylene vinyl acetate (also known as EVA) are used along with hydroxyapatite to prepare a biocompatible composite.

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