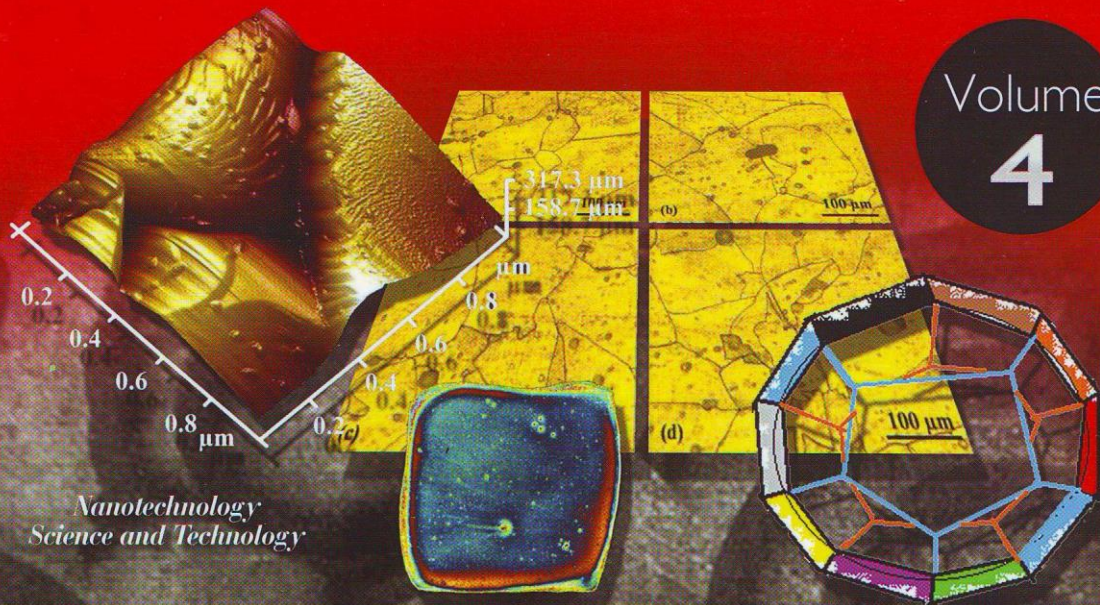


Comprehensive Guide for Nanocoatings Technology

Application and Commercialization

Volume
4



*Nanotechnology
Science and Technology*

Mahmood Aliofkhazraei

Editor

NOVA

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Chapter 7

FABRICATION OF NANOCOMPOSITE CALCIUM-PHOSPHATE COATINGS BY THERMAL SUBSTRATE METHOD

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ABSTRACT

In recent years, the use of bioactive calcium phosphate coatings for medical implants has been attracting much attention. Metallic materials are widely used in biomedical field as orthopedic and dental implants, however, problems associated with metal implants still exist causing some undesired side effects and limiting their uses. Bioactivity of metallic implants may be improved by various methods of surface modification: chemical treatment of substrates, deposition of hydroxyapatite, carbonate apatite and composite coatings, containing calcium phosphates combined with various biomolecules: alginate, collagen, chitosan, gelatin.

A large amount of calcium phosphate coatings deposition techniques is proposed in literature, but only few of them allow obtaining multifunctional organic-inorganic coatings. Thermal substrate method (TSM) for coating deposition is in the focus of attention in presented chapter. It is based on principle of thermal activation near a substrate surface, immersed in an aqueous solution, containing components for hydroxyapatite synthesis and coating deposition due to the decrease of HA solubility with increasing substrate temperature. With chemical pretreatment (solutions of NaOH, H₂O₂, and HF) performed prior to deposition, the coatings become more uniform and thick with improved adhesion. Change of the experimental conditions (time of deposition, pH of the initial solution, ionic composition, surface modification, polymer addition) allows obtaining coatings with various crystallinity, phase composition (single-phase or two-phase), porosity, surface morphology, and properties. The thermal substrate method is a one-step technique for deposition of organic and inorganic components directly on the