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Preparation and characterization of porous titania and zirconia-hydroxyapatite by modified sol-gel method

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Porous hydroxyapatite materials have received much attention because of their wide applications as biomaterials, absorbents and catalysts. The high biologic reactivity of hydroxyapatite resides in the easy exchange of the HPO_4^{2-} surface groups by CO_3^{2-} ions or organic species such as RPO_4^{2-}, RSO_4^{2-} and RCOO- is considered. Several sites of P-OH groups on the hydroxyapatite surface are responsible for the adsorption of mineral and organic species. Therefore, there were several reports on the preparation of porous apatite's for medical and environmental applications. In this work, we describe a novel alternative sol-gel-based approach relying on the *in-situ* formation of a metal oxide gel from a metal alkoxide, in the presence of preformed apatite nanoparticles. We have selected Zirconia and Titania, as additives, to improve the chemical and mechanical stability of hydroxyapatite as biomaterials. Zirconia and titania-hydroxyapatite nano-composites were prepared by sol-gel deposition from Zirconium and Titanium alkoxide solutions, respectively, in the presence of apatite colloidal suspension under ultra-sonication. The material porosity evolves mainly from microporous Zirconia and Titania to mesoporous hydroxyapatite, with decreasing surface area and increasing pore volume. XRD studies indicate that the apatite phase is well-preserved within the composite materials. These materials are micro and mesoporous over a wide range of composition, which make them promising materials for biomedical and environmental applications. In terms of surface properties, the nano-composites which are prepared constitute an attractive adsorbent and a photoactive supports with low-cost materials. Two approaches were explored in this study: The first relies on the preparation of hydroxyapatite from Moroccan natural phosphate. In this study we have described a new synthetic route leading to homogeneous mesoporous materials for the removal of heavy metals from aqueous solution. The second relies on the formation of hydroxyapatite in the presence of TiO_2 and ZrO_2 as photoactive for degradation of toxic organic moieties. Based on XRD, solid state NMR, N2-sorption and electronic microscopy, the extensive characterization provides basis for the understanding of the sorption and degradation behaviors.

Biography

Sanaâ Saoiabi has her expertise in researches of photocatalyse and medicine (biomaterials), focused on the development of porous organoapatite using a novel method of the preparation for biotechnological and environmental applications. During her PhD program in Physical Chemistry and Nanotechnology at Harvard Medical School and MGH as a recipient of a Fulbright scholarship in USA she prepared a novel material based on hydroxyapatite in order to obtain improved metal immobilization properties and she has conducted high resolution solid state NMR spectroscopy measurements on the apatite nanoparticles. Some of her research has been carried out at Pierre et Marie Curie University (UPMC) - Sorbonne Université and Collège de France in Paris.

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