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# Structurally and Morphologically Tailored Hydroxyapatite-Based Materials for Effective Copper (II), Lead (II) and Chromium (III) Ions Immobilization

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In the present study, calcium hydroxyapatite powders (HAP) have been tested for their ability in removing heavy metal ions from aqueous solutions. HAP samples have been synthetized in different conditions (i.e. varying Ca/P ratio and solvent nature) to tune the material properties. Synthetic stoichiometric hydroxyapatite (s-HAP, (Ca/P)≈1.67), Ca-deficient hydroxyapatite (d- HAP, (Ca/P)≈0.9) and hydroxyapatite precipited from hydro-alcoholic solution (a-HAP, (Ca/P)≈1.67) were batch tested in simulated polluted waters. Single-metal systems with different Cu(II), Pb(II) and Cr(III) initial concentration (Cu: from 1.8 to 5.4 mmol/L; Pb: from 1.6 to 4.8 mmol/L; Cr: from 0.3 to 5.8 mmol/L) were studied. Single metal components and binary-metal component were investigated. These studies allowed to gain deeper knowledge on the efficiency and selectivity of the heavy metal ions removal by HAPs. Leaching tests were also performed to confirm the permanent nature of the metals confinement.

The prepared materials have been chemically-physically characterized by FT-IR spectroscopy, X- ray powder diffraction (XRPD) and N2-adsorption/desorption analyses. The characterization was carried out on the HAPs before and after contacting the heavy metal containing solution, to evaluate the structural and morphological modification induced by the metal immobilization.

The results revealed that different mechanisms are involved in the heavy metal ions uptake by HAP: Cu(II) was principally removed by ion-exchange with $Ca^{2+}$ while Pb (II) was immobilized through a dissolution-precipitation mechanism, leading to the formation of a new hydroxypyromorphite (Pb10(PO4)6(OH)2) phase. The Cr(III) uptake mechanism depends on pH and initial Cr(III) content. Concerning HAP, it was found that its structural and morphological properties may influence the metal capture mechanism.

**Biography:**

Michele Ferri obtained his Master Degree in Industrial Chemistry in October 2016 at Università degli Studi di Milano. Scientifically formed as an electrochemist applied to corrosion engineering, he recently joined the group of Professor Gervasini and, as Ph.D student, he is actually working on the synthesis, characterization and use of hydroxyapatite-based materials for the removal of heavy metal ions from wastewaters. In addition, he is exploring the possible development of HAp-based sensors for the identification/quantification of metal ions in polluted waters.