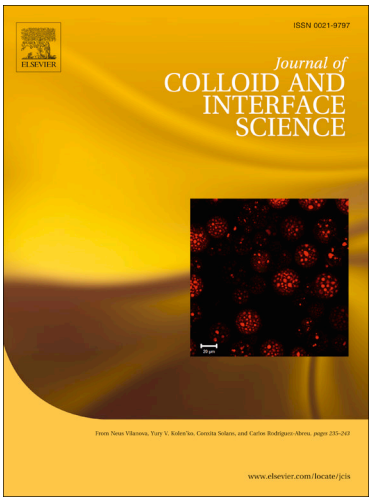

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Selective removal of phosphate by dual Zr and La hydroxide/cellulose-based bio-composites

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Abstract: Dual metal oxides nanocomposites always exhibited the better phosphate capacities than those single metal oxides samples. Herein, the high carbohydrate-content biomaterials, shaddock peels (SP), were used as the bio-carrier for supporting the dual metal oxides, zirconium (Zr) and lanthanum (La) hydroxides, forming the SP-Zr-La composites. Phosphate adsorption properties as well as stability of the novel composites were evaluated. The SP-Zr-La composites indicated that some rod-like or amorphous nanoparticles with sizes of 20-150 nm were anchored inside the SP, which exerted more available interface interactions towards the adsorbed ions. The Zr-La species were pH-sensitive and adsorption capacity of phosphate by SP-Zr-La was increased with the rise in temperature. As the molar ratio of accompanying ions/phosphate was increased from 0 to 10 times, the SP-Zr-La was observed with the adsorption loss of 27.2-36.7%. Whereas the adsorption loss of cationic SP (grafted with quaternary ammonium groups) was calculated up to 86.2-91.6%; this indicated the more feasibility of SP-Zr-La in real applications. In addition, the stability of impregnated Zr and La species in SP-Zr-La was greatly improved by the bio-carrier through the "shielding effect" in a low HA surrounding.

Keywords: Zr hydroxides; La hydroxides; Phosphate; Biomaterials; Composites

1. Introduction

Phosphorus is considered as the essential element required by multiple industrial applications, e.g. foods, liquid detergent, fertilizers, pesticides, drugs [1, 2]. However, a large amount of phosphorus-containing wastes originated from these industrial applications always result in excessive phosphorus in the aquatic environment [3-5]. It

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