Highly efficient nanostructured materials for water decontamination loaded with hazardous pollutants

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Abstract

Currently, due to rapidly industrialization and urbanization, water pollution has become a global issue of utmost importance, significantly affecting public health and the environment. Hazardous substances, such as heavy metals, volatile organic compounds, pesticides, and pharmaceuticals, enter water sources as a result of various human activities. In this context, nanostructured materials offer innovative solutions for the efficient purification of polluted water, thanks to their unique properties, such as large surface area, high catalytic activity, and the ability to absorb and degrade different pollutants.

The primary objective of research on nanostructured materials for water purification is to develop new and efficient materials for removing hazardous pollutants from water sources, thus ensuring safe drinking water for human consumption as well as other industrial uses. This initiative aims to reduce the negative impact of water pollution on health and the environment, thereby supporting the achievement of sustainable development goals and the protection of water resources.

In this context, various phosphate-based hydroxyapatite materials have been synthesized and characterized, applied within two water depollution methods, demonstrating significant advantages compared to conventional materials reported in the literature. Additionally, a synthesis method has been developed for the large-scale production of the apatite-based adsorbent material, which was later used in a facility with a high level of technological maturity.

Keywords: phosphate nanomaterials; hydroxyapatite; water decontamination; emerging pollutants; adsorption; photocatalysis