Magnetic nanoparticles of zinc/calcium ferrite functionalized with silver clusters for photodegradation of dyes

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Magnetic nanoparticles have recently emerged in a wide range of applications, namely in controlled drug delivery, magnetic hyperthermia, medical imaging and environmental remediation, among others. In the environmental field, several works have reported the ability of a variety of magnetic nanoparticles for dyes photodegradation.

In this work, magnetic composite nanoparticles of zinc/calcium ferrite and silver were developed and characterized. The nanoparticles were prepared by a co-precipitation method using reflux conditions. The magnetic properties of the synthesized nanoparticles allow their recovery after use in water remediation.

The photocatalytic activity of the developed nanoparticles was assessed through irradiation tests in a home-built equipment using visible radiation. Solutions of a model dye (Rhodamine B) and industrial dyes supplied by textile companies ("Red", "Yellow" and "Blue") were used for this investigation. The observed photocatalytic activity is very promising for future industrial applications, as an efficient degradation of either Rhodamine B or the industrial dyes was obtained.

In summary, the objective was to develop optimized nanosystems that combine suitable magnetic properties with a high photocatalytic activity using visible light. The possibility of magnetic recovery of the nanoparticles and their reutilization points to encouraging real applications of this sustainable technology, especially in the textile industry.