11th International Conference on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

MORPHOLOGIC PROPERTIES OF FERRITES NANOPARTICLES APPLIED TO HETEROGENEOUS CATALYSTS

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Abstract – The Fenton homogeneous process is an efficient method in the dye's degradation, but the reaction requires pH about 3, and the cost of the process is high, becoming unfeasible. An alternative is to use particulate materials, such iron minerals, as heterogeneous catalysts in the Fenton reaction. In the present work, iron oxide nanoparticles were synthesized for use as catalysts in a heterogeneous Fenton process. They were characterized by XRD, Mossbauer Spectroscopy, FEG and surface area through N_2 physisorption. UV-visible spectroscopy revealed that the nanoparticles obtained in this work shown catalytic activity in Rhodamine B degradation.

Contamination of waters is a world problem, that has if turned very preoccupying. An example is the effluents generated by the textile industries. The effluents they possess, besides other pollutants, dyes that are responsible for the toxicant potential that cart several environmental problems [1]. The water's color is a physical indicator of their quality, interfering directly in the photosynthesis process. The Fenton homogeneous process [2,3], one of the most active methods for generating highly oxidant species, is reportedly very efficient in the dye's degradation. However, despite the benefits of the process, the Fenton reaction is still not very attractive due to its drawbacks. The working system requires a pH of about 3, and the cost of the process and of the other reactants is high because the characteristics of the process render the reuse of the homogeneous catalyst (iron salts) unfeasible. An alternative is to use particulate materials, such as iron minerals, as heterogeneous catalysts in the Fenton reaction.

Thus, in the present work, iron oxide nanoparticles were synthesized for use as catalysts in a Fenton process. Nanoparticles composed of iron oxides and iron salts were obtained from polymeric resins produced by polymerizing Fe^{2+}-citrate and Fe^{3+}-citrate complexes with ethylene glycol. The citric acid:Fe molar ratio was varied to obtain different synthesis conditions. The materials were treated at 450^{o}C for 2 h to obtain nanoparticles, which were characterized by XRD, Mossbauer Spectroscopy, FEG (Figure 1) and surface area through N_2 physisorption. Rhodamine B degradation in the presence of these nanoparticles and hydrogen peroxide was carried out to analysis the possible behavior of nanoparticles as heterogeneous Fenton reactants. UV-visible spectroscopy revealed that the catalytic activity in the presence of nanoparticles obtained with a citric acid:Fe molar ratio of 12:1 was the condition that provided the best results in this work.

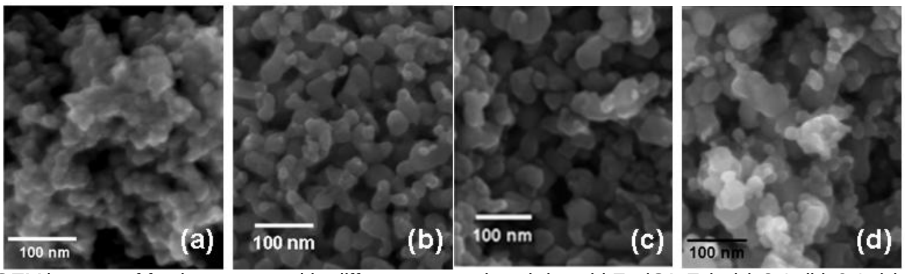

Figure 1: FEG-SEM images of ferrites prepared in different proportion citric acid:Fe (CA:Fe). (a) 3:1, (b) 6:1, (c) 9:1, (d) 12:1.

References

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