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Author: A.F. Lubambo L. Ono V. Drago N. Mattoso J. Varalda
M.-R. Sierakowski C.N. Sakakibara R. Freitas C.K. Saul



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Tuning Fe₃O₄ nanoparticle dispersion through pH in PVA/ Guar Gum / Electrospun Membranes

Lubambo, A. F.^{1,*}, Ono, L.,² Drago, V.,³ Mattoso, N.,¹ Varalda, J.¹, Sierakowski, M.-
R.,⁴ Sakakibara, C. N.,⁴ Freitas, R.,⁴ Saul, C. K.¹

1 – Department of Physics, Universidade Federal do Paraná-UFPR, Centro Politécnico, Curitiba-PR, P.O Box 19044, Brasil. 2- Department of Pathology, Universidade Federal do Paraná-UFPR, Centro Politécnico, Curitiba-PR, P.O Box 19031, Brasil. 3- Department of Physics, Universidade Federal de Santa Catarina-UFSC, Campus universitário Reitor João Davi Ferreira Lima, Florianópolis-SC, Brasil. 4–Department of Chemistry, Universidade Federal do Paraná-UFPR, Centro Politécnico, Curitiba-PR, P. O. Box 1908, Brasil.

ABSTRACT

Polyvinyl Alcohol (PVA) / Guar Gum (GG) membranes with different loads of paramagnetic iron oxide Fe₃O₄ nanoparticles were successfully electrospun using both non-alkaline and alkaline stock solutions. The nanoparticle homogeneity distribution was clearly enhanced in fibers obtained from alkaline stock solutions. This is mainly due to the interaction between GG and the metallic ion, which also leads to further dispersion of remained uncoated nanoparticles in the mixture. It was also noticed that GG favors nanoparticle stability in the mixture and contributes to nanoparticle encapsulation. X-ray results showed that all membranes were semi-crystalline. FTIR-ATR spectra showed that Fe-O absorption band intensity improved with increasing nanoparticle load, reaching saturation at 3.5 mg/ml Fe₃O₄ concentration under alkaline conditions. VSM analyses showed that the nanoparticles are paramagnetic and were successfully incorporated by the fibers. In vitro biocompatibility tests using L929 cells indicates adequate levels of cytotoxicity and cell

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