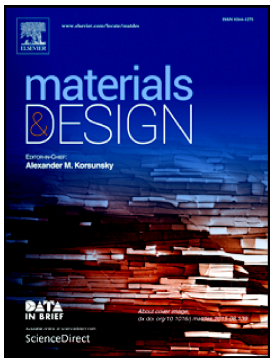

Development of magnetite nanoparticles/gelatin composite films for triggering drug release by an external magnetic field

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DEVELOPMENT OF MAGNETITE NANOPARTICLES/GELATIN COMPOSITE FILMS FOR TRIGGERING DRUG RELEASE BY AN EXTERNAL MAGNETIC FIELD

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Abstract

Films of magnetite nanoparticles/gelatin composite (gelatin/NPs) with a magnetic response allowing controlled drug release by an external magnetic field were developed. The controlled release of acetaminophen as a model drug by the diffusion mechanism was tested using the gelatin/NPs films and different external magnetic fields. Composite material films of gelatin/NPs were made by dispersion of magnetite nanoparticles into gelatin solution. The nanoparticles were characterized by FTIR, Zeta potential, and TEM. The gelatin/NPs composite films were analyzed by FTIR, Raman and Mössbauer spectroscopy, the thermal properties of the films were analyzed by DSC and their magnetic properties by magnetization curves (M vs H) and magnetic force microscopy (MFM). The films were evaluated in a diffusion cell containing acetaminophen solution for 24h using a permanent magnet as a remote trigger device. The results showed that gelatin/NPs composite films do not exhibit a high oxidation level of the nanoparticles contained in the gelatin matrix. The magnetic properties of magnetite NPs were not affected by interaction with the polymeric matrix. Furthermore, the diffusion results enable the conclusion that the response of gelatin composite films to an external magnetic field modified the release percentage of drug, in accordance with the magnitude of the field.

Keywords: Magnetite nanoparticle; bioactive films; stimuli-responsive system; composite material