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MATHEMATICAL MODELLING OF THE RELEASE PROFILE OF ANTHRAQUINONE-DERIVED DRUGS ENCAPSULATED ON MAGNETITE NANOPARTICLES

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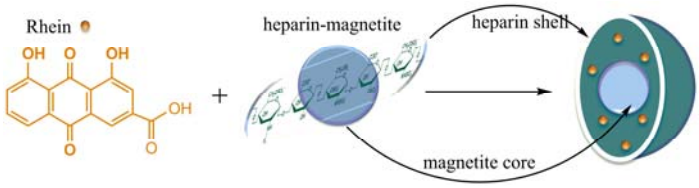
The paper describes the kinetics of rhein antitumor drug release from the heparin shell of magnetite nanoparticles, monitored by UV measurements and expressed through a fractal approximation based on Weibull model. A good correlation coefficient between the experimental curve and the Weibull fitted curve was found, pointing that the diffusion mechanism obeys a complex non-Fickian profile, with a large number of degrees of freedom in the phase space. The calculated parameters are in correlation with the fractal dimension, which depends on diffusion order. The chosen fractal mathematical pattern uses a reduced number of approximations with the purpose of simplifying mathematical modeling, which, otherwise, proves to be quite complex.



INTRODUCTION

Iron oxides are the most used magnetic materials. Among them, magnetite and maghemite are suitable for biomedical applications,[1] being extensively used as carriers for antitumor drugs. The vectors containing them are considered to represent the next generation of targeted delivery systems,[2] as a promising way to substitute the chemotherapy.[3] The drug delivery efficiency of such vectors is directly dependent on the magnetic properties of the nanoparticles, but also on their size.[1]

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