Evaluation of drug delivery the base of Fe_3O_4@SiO_2/ciproflonax for the treatment of osteomyelitis.

P. M. A. G. de Araújo [1*], S. M. C. M. Bicalho [2,] L. S. Conrado[3], Manoel R. Silva[4], A. C. F. M. Costa[1]

[1] Federal University of Campina Grande, Department of Materials Engineering, 58429-140 Campina Grande, PB, Brazil.

[2] Federal University of São Carlos, Department of Materials Engineering, 13564-280 São Carlos, SP, Brazil.

[3]Department of Chemical Engineering - Federal University of Campina Grande. Avenue Aprígio Veloso, 882- CEP: 58109-970 - Campina Grande- PB – Brazil.

[4]Federal University of Itajubá, Department of Physics; Mailbox: 50 - Itajubá - MG - CEP: 37500-903
* Corresponding author: pascally.guerra@gmail.com

Nanotechnology has been developing new chemotherapeutic drug delivery that act it in place of action. However, efficient release of molecules requires high specificity for the target that only achieved can be by receptor-specific binding. In recent years, Fe_3O_4 extensively studied has been because of its unique physicochemical properties and potential biomedical applications in magnetic hyperthermia, targeted drug delivery, magnetic resonance imaging, and cell sorting. However, to avoid coalescence, stabilize the magnetic core and create points of conjugation between Fe_3O_4 and the drug, the Fe_3O_4 magnetic nanoparticles coated have been with SiO_2. In this context, this work proposes the development of a new carrier Fe_3O_4@SiO_2/ciproflonax for the treatment of osteomyelitis. In order to do so, the magnetic nanoparticles synthesized were by combustion reaction and coated with TEOS and APTS silica precursors (SiO_2) according to the Stöber methodology after modifications. After obtaining the Fe_3O_4@SiO_2 hybrids, 10% of the drug ciproflonax was added and agitated by means of the physical mixture in a magnetic stirring plate later the hybrids characterized were by XRD, FTIR, MEV, granulometric distribution, magnetic measurements and submitted to tests of drug release in a discontinuous system. By means of the results of XRD, the presence of the main phase of the magnetite observed, and as second phase the hematite and traces of the drug. From the FTIR spectrum, the presence of Fe_3O_4, SiO_2 and drug bands observed was. The granulometric distribution evidenced the presence of a narrow, monomodal and symmetric curve. The MEV evidenced the formation of spongy agglomerates of irregular shape. By means of magnetic measurements, typical behavior of ferrimagnetic materials observed was. The release of the drug ciproflonax into the Fe_3O_4@SiO_2 hybrid occurred in a controlled manner, with excellent absorption. All these characteristics make this system promising as a drug carrier in the treatment of osteomyelitis.

Key words: Fe_3O_4@SiO_2, drug delivery, osteomyelitis.