PhD THESIS

Smart drug delivery systems based on graphene oxide and natural agents for biomedical and pharmaceutical applications

Abstract

In the past few years, the major interest has been directed towards developing innovative localized/targeted drug delivery systems (LDDS) that facilitate the transport of therapeutic agents to specific site of interest into the body. In the present thesis, the main goal was to design novel drug delivery systems (DDS) based on GO as nanocarrier, loaded with bioactive natural agents (gallic acid (GA), juglone (J) and quercetin (Q)) with anticancer, anti-inflammatory, and antimicrobial properties with applications in biomedical field. Moreover, electrospinning technique was used to develop innovative poly(lactic) acid (PLA)/GO electrospun scaffolds loaded with Q as a model drug, in order to demonstrate the triggered delivery capacity and the potential of the scaffolds to be used as wound dressing materials. Physico-chemical and morphological characterization of the obtained materials were evaluated by using the following techniques: FTIR, XRD, DLS, TEM, SEM, TGA, HPLC-MS, FTIR microscopy and MALDI-HRMS, UV-Vis. Also, the electrical triggering capacity, antimicrobial assay and biocompatibility were also investigated. The obtained results demonstrate the possibility of developing GO-based supports for the electrically triggered delivery of biological active agents, with the delivery rate being externally controlled in order to ensure personalized release. The electrically triggering delivery of Q from PLA/GO scaffolds may open the new perspectives in regeneration but also in the treatment of different diseases in a personalized manner, the delivery rate being adapted according to the needs of the patient.