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ABSTRACT

Ordered Nanoporous Silica as a Diffusion-Controlled Drug Delivery System

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Mesoporous silica particles (MSNs) for targeted drug delivery have been intensively studied in recent years [1]. The loading and release of drugs from the silica mesopores is a complex process and depends on many parameters, such as different solubility of guest molecules in a solvent, different diffusion rates throughout the pores and/or the strength of the interactions between loaded molecules and MSNs. The spatial confinement within mesopores can reduce the crystallisation of the amorphous drugs, and compared with the crystalline drugs, the amorphous drug can reduce the lattice energy, resulting in improved dissolution rate and enhanced bioavailability. Moreover, MSNs are biocompatible and are degradable in body fluids; thus, problems related to removing the material are avoided. In the contribution, our research concerning MSNs as drug delivery systems will be presented. We have studied the systems that release drugs either on diffusion principle and/or external stimulus, e.g. light, pH-driven drug release ([2] and references therein). MSMs have been used for the delivery of a variety of drug molecules, e.g., chemotherapeutics, antibiotics or anti-inflammatory molecules. Our recent work concerns antithrombotic and thrombolytic drugs. The problem with antithrombotic drugs is their short half-life, thus frequent dosing is required. The administration of antithrombotics via silica can prolong their half-life, uniform administration and reduce therapeutic doses.

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