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# Synthesis of mesoporous MCM-41 silica nanoparticles and surface modified by chitosan functionalized with folic acid for targeted drug delivery and controlled release

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So far, various materials have been used for the design of drug delivery systems. Among these materials, meso-porous silica nanoparticles have attracted many attentions due to their special characteristics such as high surface area, uniform pore size, large pore volume, and most importantly the selective functionalization of their internal and/or external surfaces.

In this project, the meso-porous MCM-41 silica nanoparticles have been made using conventional sol-gel method. At the next step, the anti-cancer drug (Capecitabine) molecules are loaded in the pores of nanoparticles that are immersed in the drug's solution. After that, the chitosan with folic acid was used as the ligand-targeted agents and also as a coating on the drug carrier nanoparticles. Finally, the drug release from nanoparticles are examined in PBS environment (at 37oC , pH = 7. 4).

In order to determine the absorption and the release of the drug, the UV-Vi method has been used. The morphology and surface properties of MCM-41 nanoparticles have been studied using the SEM and BET techniques. The FTIR spectroscopy has been used to study the folic acid's binding to chitosan, and the TGA analysis is also used to determine the amount of covered polymer on the nanoparticles.

The comparison between the obtained release charts indicates the controllability of the drug release from the modified nanoparticles. Overall, in this thesis we modified the nano-carriers in both aspects of controllable release and being as targeted agents. These aspects not only improve the performance of drug's molecules, but also reduce the harmful side effects of these drugs. This procedure could be very useful, especially for those drug molecules which require organic solvents with potential side effects, e.g. in chemotherapy for cancer treatment.

***Keywords**:* Drug delivery systems, Mesoporous silica nanoparticles, MCM-41, Surface modification, Capecitabine, Controlled release

**References**

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