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Functionalized mesoporous silica nanoparticles for pH-responsive and controlled anti-cancer drug delivery

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ABSTRACT

In this work, mesoporous silica nanoparticles were synthesized via hydrothermal process using tetraethyl orthosilicate (TEOS) as silica source and cetyltrimethylammonium tosylate (CTATos) as structure directing agent. The mesoporous silica exhibited high surface area (342 m^2g^{-1}) and dual pores (3.3 and 33.4 nm) with uniform size. The mesoporous silica materials modified with carboxyl groups were synthesized by post-grafting method and drug molecule release behavior was studied by loading of cisplatin as model drug of anticancer drug. Drug release was about 2-fold higher in acidic condition (pH 4.0) than in neutral condition (pH 7.3). Cell viability was tested using three types of cancer cells (A549, A2780, MCF-7). When the sample containing the drug (Pt/COOH-MesoSiO_2) was applied, the cancer cell death was more pronounced than the drug-free samples. (Cell survival rate 6.8% for A549, 18.8% for A2780, 17.7% for MCF-7) Cisplatin-loaded mesoporous silica (Pt/COOH-MesoSiO_2) is an excellent candidate with high applicability as an anticancer agent.

REFERENCES

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