

Wetting properties of bi-layer chitosan-silica drug delivery coatings

Kitozán-szilika hatóanyag-leadó bevonatok nedvesedési tulajdonságai
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Summary

Controlled drug release systems have been intensively investigated during the last decades. Both porous silica and chitosan based systems, mainly nanoparticles were found to be well applicable in drug release systems.

Our purpose with this study was to investigate the wetting properties of porous silica thin layer, coated with chitosan polymer in connection with drug release behaviour.

Porous silica thin layers were deposited onto glass substrates by dip-coating technique from the ethanolic solution of tetraethyl orthosilicate and cetyltrimethylammonium bromide (precursor sol). With a calcination procedure a well-defined mesoporous system was formed and Rhodamine 6G dye was then incubated into it as a model drug. Chitosan coatings were prepared from acetic acidic solution of the polymer onto the incubated porous silica layers and onto glass substrates as well. Some of the polymer coatings were cross-linked ionically with sodium tripolyphosphate and others covalently with glutaraldehyde (GDA). This was accomplished by immersing the samples into the aqueous solution of cross-linking agents.

Drug release studies were performed in phosphate buffer solutions. The samples were immersed into buffer solution and from time to time the released amount of model drug was measured by UV-Vis spectroscopy. One could observe a retard effect in case of porous silica layers coated with TPP cross-linked chitosan which effect was much more significant in case of GDA cross-linked coatings.

To investigate the wetting properties of different polymer layers, contact angle measurements were performed. The time evolution of contact angle of buffer solution was monitored for 20 minutes in saturated vapour atmosphere. It was enough time to reach an equilibrium value of contact angle. When investigating non-cross-linked chitosan layers, at the first stage a fast decrease in the values of contact angles was observed, that was not observed for cross-linked polymer layers. The thickness of the layers seemed to have no effect on the wetting properties of the coatings. Some relationship of wetting properties to the drug release behaviour was revealed providing a better understand of the drug release mechanism.

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