

***Elnyújtott hatóanyag leadásra alkalmas hibrid
kettősrétegű modellbevonatok fejlesztése***
Development of hybrid bi-layer model coatings for extended drug release
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Summary

Extended drug release systems have been in the scientific spotlight for many years. Applying these systems for drug release, it is possible to reach the usually preferred sustained plasma level instead of having peak-and-trough plasma profile which is often associated with drug delivery by tablets or injections.

Thin films with porous structure such as porous silica could be used for drug release systems. The widely used dip-coating technique was used to form thin layers. This technique possesses lots of advantages: it is relatively easy and inexpensive to carry out and gives a simple and well-defined possibility for modifying the thickness of the layers with changing the withdrawal speed. Rhodamine 6G dye - with an absorbance maximum in dilute solutions at 528 nm - was used as a model drug to be able to observe the amount of the released agent.

Chitosan is a biocompatible and non-toxic biopolymer which can form hydrogels with pH sensitive swelling properties. All these properties make chitosan applicable for controlled drug release. It is even possible to make a solution from chitosan in acetic medium and then to form thin polymer layers to a substrate.

Our goal was to prepare double layered drug release model coatings from porous silica thin basic layer and from polymer layers (mainly chitosan). We investigated the release of the model drug from the basic porous silica layer and from the bi-layer coating. Our further goal was to extend the release time with cross-linking the chitosan thin layer.

A precursor sol containing tetraethyl-orthosilicate, hydrogen chloride and hexadecyl-trimethyl ammoniumbromide as a template in ethanol medium was applied for the dip-coating procedures. Glass substrates were dip-coated with applying this precursor sol and then the layers were annealed at 480 °C for 1 hour to form porous structure. These porous silica layers were dipped into 10⁻³ M aqueous Rhodamine 6G solution with an appropriate dipping speed to incubate Rhodamine 6G into the porous structure.

After drying the samples, chitosan layer and cross-linked chitosan layer were formed onto the incubated porous silica layers with the usage of acetic acid solution of chitosan and pentanatrium-tripolyphosphate (TPP) solution with pH = 6. The release of the model drug from the layers was studied with immersing the samples into buffer solution (pH = 7.3) and measuring the absorbance of the solutions from time to time. This way we were able to get the percentage of the released drug in the function of the time.

It was found that with having only porous silica layer, an extended drug release can be achieved. A second chitosan layer does not really make a great effect but if cross-linking it with TPP, it is possible to extend furthermore the release time.

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