

# Controlled Drug Release from Contact Lenses Prepared by Using the Layer-by-Layer Method

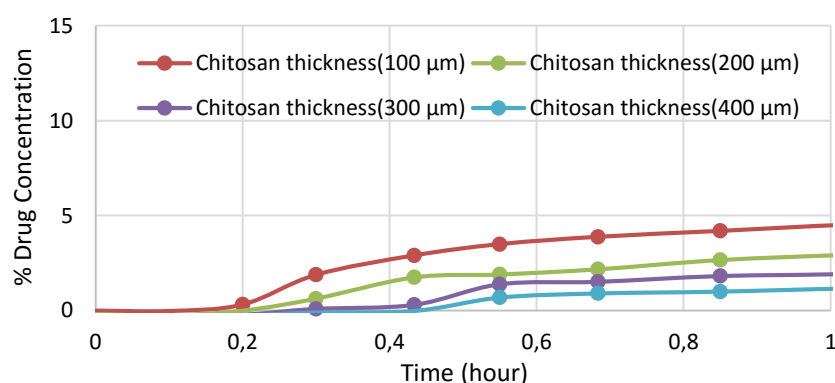
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In recent years, researchers focus on the controlled release of ophthalmic drugs from contact lenses. Synthetic polymer p-HEMA is widely used as soft contact lens material in the biomedical applications. However, drug loaded p-HEMA contact lenses release the drug in a few hours, which is an undesirable situation. Even though it is more successful than eye drops and ointment, sustained drug release cannot be provided as desired<sup>[1]</sup>. Thus, there are some methods to slowdown the drug release such as surface of hydrogels modification using micro and nano particle<sup>[2]</sup>.

In this study, it is aimed to develop drug loaded p-HEMA contact lenses for the treatment of the conjunctivitis, which is one of the common eye diseases. Dexamethasone is one of the drugs used for the treatment, was added into hydrogels. The surface of hydrogels is modified via "Layer By Layer" (LbL) technique, in which chitosan (cationic) and hyaluronic acid (anionic) were used to form layers. By using this technique, it is possible to obtain up to ten layers. The formation of each layer was monitored by measuring absorbance, light transmittance and water contact angle of the lenses. Moreover, a thick layer of drug free chitosan was added on the top of the contact lenses, which already had five layers formed via LbL technique, as mentioned before. Addition of 5 layers on the top of the contact lenses was reduced the drug release from 60 % to 30 % in 50 hours. It was demonstrated that the formed chitosan/hyaluronic acid layers act as a barrier for drug release. Moreover, addition of chitosan layer on top of the contact lenses allowed us to see a delay time before the release of drug as well as it prevented the burst release. The observed delay time varied with the changing thickness of the chitosan layer applied. As it is seen from Fig.1, the delay time increased from 15 minutes to 45 minutes with the increase in thickness. Thus, controlled drug release was accomplished.. Also, side effects of the drug are eliminated which is released at the beginning. These experiments show clearly that drug release rate and released drug amount can be adjusted according to the patient's suggested drug regimes without losing the other functions of contact lenses such as correcting the vision.



**Figure 1.** Drug release from p-HEMA contact lenses that were modified by using LbL method as well as drug free chitosan layers with different thickness.

[1] C. Le Boultais, L. Acar, H. Zia, P.A. Sado, T. Needham and R. Leverage, *Prog. Retinal Eye Res.*, 1998, **17**, 33.

[2] Y. Kapoor, J.C. Thomas, G. Tan, V.T. John and A. Chauhan, *Biomaterials*, 2009, **30**, 867.