

BIOLOGICALLY ACTIVE POLYMER HYDROGEL MATERIALS FOR TRANSDERMAL SUBSTANCE DELIVERY SYSTEMS

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The current trend in the development of biologically active polymer materials is their active use in transdermal delivery systems of drugs and active substances in the human body. A state-of-the-art representative of biologically active polymer materials for transdermal delivery systems are patches and plasters that contain microneedles of micron size. The main purpose of transdermal microneedle patch and patch systems is to create microscopic holes and transfer molecules into the deeper layers of the skin, with poke and release being one of the most commonly used strategies.

In this study, smart bioactive humic-polymer hydrogel transdermal materials based on gelatin and sodium alginate modified with humic acids have been developed and studied. A literature review was carried out and the prospects of using humic acids for a functional effect on the transdermal properties of a smart biologically active humic-polymer hydrogel have been proved. The aim of the article is to study smart alginate–gelatin transdermal hydrogels modified with humic acids have been developed.

Materials used to develop smart bioactive humic-polymer transdermal hydrogels:

- food grade gelatin R-11 (Ukraine);
- sodium alginate (China);
- humic acids were obtained by extraction from lignite (brown coal).

Based on the results of the experimental research of conditional viscosity and electrical conductivity, the chemical structures of the sodium alginate–gelatin systems modified with humic acids were proposed. The influence of the content of humic acids on the swelling degree and the moisture-lipid balance of the skin was studied. It was found that efficient processes for obtaining smart bioactive polymer-hydrogel transdermal materials based on gelatin and sodium alginate can be carried out at concentrations of humic acids from 2.5 to 7.5 wt.%. Modification of these hydrogels with humic acids causes the formation of structures with a higher degree of crosslinking due to more hydrogen bonds, as well as the formation of more agglomerates. As an example of the practical use of the obtained smart bioactive transdermal materials, their suitability for use in cosmetic patches was confirmed by the results of the study of swelling and moisture-lipid balance of the skin in the area around the eyes. The prospect for the use of smart biologically active humic-polymeric transdermal hydrogel materials based on gelatin and sodium alginate modified by humic acids in cosmetic patches have been shown.