CHANGE IN THE STRUCTURAL CHARACTERISTICS OF AEROGEL MATRICES BASED ON SiO_2 AND NCC UPON IMPREGNATION WITH MEFENAMIC ACID

Kuzmikov M.S., Dyshin A.A., Kraev A.S., Oparin R.D., Kiselev M.G.
Institute of Solution Chemistry of the RAS
153045, Ivanovo, Akademicheskaja st., 1

Composites creation based on aerogels of various natures with active pharmaceutical ingredients (APIs) opens up broad prospects for controlled drug delivery. In this work a comparative analysis of the structural changes in the three-dimensional framework of aerogels based on nanocrystalline cellulose (NCC) and silica (SiO_2) upon impregnation with mefenamic acid (MA) at different temperatures was carried out. The drying and impregnation processes were carried out in a supercritical carbon dioxide medium.

Analysis of nitrogen sorption isotherms for the pristine aerogels showed that both types of matrices possess a developed mesoporous structure. The presence of nanoscale slit-like pores in the NCC aerogel samples is specifically noted. For such matrices, impregnation at 80°C proceeds without changing the three-dimensional structure. At the same time, impregnation at 140°C leads to a restructuring of the cellulose matrix, expressed in an increase in the number of pores of about 3 nm after the release of MA. This is associated with an increase in the concentration of MA, the formation of a bulk phase inside the pores, and as a consequence the emergence of disjoining pressure. For SiO_2 aerogels, similar studies were conducted in the same temperature ranges. A comparison of the behavior of the matrix framework depending on their nature is presented in the report.

Varying the nature of the matrix and the temperature regime of impregnation can make it possible to regulate the structural characteristics of the final composites, which is a key factor for optimizing the release profiles of poorly soluble APIs. These effects are discussed with more detail in the report.

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