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Advanced polymer materials and technologies: recent trends and current priorities

Перспективні полімерні матеріали та технології: останні тенденції та актуальні пріоритети

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The monograph contains the materials of the 4th International Conference "Advanced Polymer Materials and Technologies", which was held on October 11, 2022 at the Kyiv National University of Technology and Design together with the Lviv Polytechnic National University. The monograph deals with the creation of new polymer composite materials and their processing technologies using extrusion, electroforming, 3D printing, and other methods; development of environmentally-oriented technologies and equipment for the production of polymeric materials for various purposes, including biodegradable ones. Considerable attention is paid to the creation of new polymer composite materials, in particular for environmental protection, using waste from the chemical industry.

The monograph will be useful for teachers, students and graduate students, scientists and manufacturers whose activities are related to the above mentioned topics.

The authors are responsible for the content of the publications.

THE POTENTIAL OF SOLID DISPERSION SYSTEMS FOR INCREASING THE SOLUBILITY OF AN ANTI-INFLAMMATORY ACTIVE PHARMACEUTICAL INGREDIENT

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Introduction. Today, many drugs that are in great demand on the pharmaceutical market have low solubility, which is the biggest obstacle to achieving the necessary biological effectiveness. Such a problem directly affects one of the most widely used groups of drugs – non-steroidal anti-inflammatory drugs (NSAIDs).

Many different strategies to increase solubilization have been developed to solve this pharmaceutical problem. One of the most interesting approaches is represented by solid dispersion systems (SDS), in which a poorly soluble pharmaceutical ingredient is molecularly dispersed in an inert carrier. Pharmaceutically acceptable polymers are usually used as carriers for the preparation of SDS. However, SDS compositions may also contain additional excipients such as surfactants.

The purpose of the study. Study of the influence of the composite composition of solid dispersed systems on the phase solubility of the active pharmaceutical ingredient of anti-inflammatory action – nimesulide.

Research materials and methods. The study of the influence of the composition of SDS on the solubility of nimesulide in the aqueous phase was carried out based on the method of Higucci and Connors. The following equipment was used for research: UV spectrophotometer Optizen POP (Mesasys, South

Korea); analytical balance AS 60/220. R2 (Radwag, Poland); laboratory centrifuge CM-8 (MICROmed, China); thermal shaker TS-100C (BioSan, Latvia).

Research results and discussion. In this paper, the phase solubility of nimesulide in the composition of solid dispersion systems based on a polymer carrier – polyvinylpyrrolidone (PVP) of different molecular weight with the addition of a nonionic surfactant was investigated. The obtained results are presented in the figure.

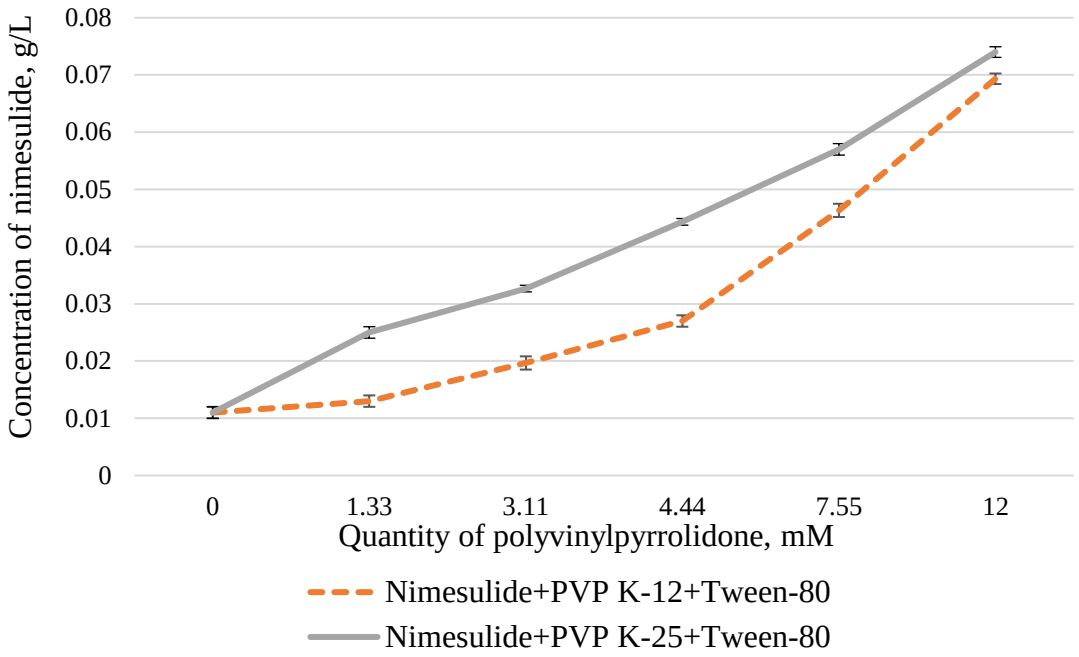

Fig. 1 *Phase solubility profile of nimesulide at the appropriate concentration of polyvinylpyrrolidone of different molecular weight with the addition of nonionic surfactant*

As can be seen from the figure, the solubility of nimesulide improved in both cases. It was established that the formation of solid dispersion systems based on polyvinylpyrrolidone K-12 and the addition of tween-80 provides a 6,27-fold improvement in the solubility of nimesulide. On the other hand, when using polyvinylpyrrolidone of higher molecular weight (PVP K-25), the solubility of nimesulide increases to a greater extent by 6,72 times.

Conclusions. The effectiveness of the application of the technology of solid dispersion systems to increase the solubility of the active pharmaceutical ingredient of anti-inflammatory action has been proven. It was established that a more significant increase in the solubility of nimesulide in a solid dispersion system with polyvinylpyrrolidone K-25 and tween 80 is 6,72 times.