

The main goal of the project is the design, preparation and characterization of a new class of materials having the ability to improve the effectiveness of penetration of drugs and active ingredients into the skin. These materials may become the basis for a new cosmetics or dermatological formulation.

The skin is the largest organ of the body. It has three main layers: the epidermis, the dermis and the subcutaneous layer. *Stratum corneum* is the outer most layer of skin, which is the actual physical barrier to most substance that come in contact with the skin. Delivery of therapeutic and cosmetic agents into skin is hindered by the epidermal barriers, therefore the problem of skin permeation process is still topical and requires further scientific investigation.

In the project, the polymer microparticles will be prepared and then microparticles-incorporated porous polymer matrices will be designed and prepared. Polymer-based microparticles used for drug delivery can be broadly classified into microcapsules and microspheres. Microcapsules contain an active agent and surrounded polymeric shell, while in the case of microspheres drug is dispersed in the polymeric matrix. The last decade is characterized by extremely rapid development of microparticulate system used in many branches of science, especially in medicine and pharmacy. Microparticulate drug delivery system is one of the processes to provide the sustained and controlled delivery of drug to long periods of time. Synthesis and characteristics of the polymer microparticles is the subject of numerous studies. Microparticles are mainly used in preparations for intramuscular and subcutaneous applications. Delivery of therapeutic and cosmetic agents into skin is hindered by the epidermal barriers, therefore the problem of skin permeation process is still topical and requires further scientific investigation.

Furthermore, polymer matrices will be modified by addition of accelerants (sorption promoters), which are chemical substances temporarily diminishing the barrier of the skin. The anticipated outcome of the project will be obtaining new, advanced, practical materials combining the advantages of both microparticles (being the carriers of the active ingredient) as well as penetration enhancers (increasing the active ingredients permeability through skin) may significantly contribute to the advancement of medical and pharmaceutical sciences. The penetration enhancers having the influence on the decrease of epidermis barrier properties incorporated in polymer environment will contribute to the creation of microtunnels in *stratum corneum*. The microtunnels will enable the active ingredients gradually released from the microparticles incorporated in polymer matrix to diffuse. Therefore, the obtained materials will then constitute of a new class of the medicinal products which may contribute to more effective permeability of active ingredients in deeper skin layers. What is more, depending on the type of the active ingredient incorporated in microparticles, the examined material might be used as a new form of cosmetic product for skin care and conditioning, or as a dressing material facilitating the process of wounds and burns healing.