Description for the general public

Majority of the products available on the market are colloidal systems. They are systems, in which one phase is dispersed in the other. It is important to maintain the stability of such systems. The addition of various substances, such as polymers, can significantly affect their stability. However, in pharmaceutical and food industry, the use of synthetic macromolecular substances is limited due to their unfavourable or untested influence on human health. Therefore, it is important to search for natural alternatives of synthetic stabilizers. Various types of cosmetics, cosmeceutical and pharmaceutical formulations also contain metal oxides. The most commonly used oxides in cosmetic industry are aluminum (III) oxide, titanium (IV) oxide and zinc (II) oxide. They are used, in different preparations such as powders, creams, lotions, pastes and ointments. Therefore, the scientific goal of this project is to use the naturally occurring polysaccharide – fucoidan – as the stabilizer for the oxide/electrolyte solution systems. This substance was also selected because of its bioactive properties and proven health-promoting potential in cosmetic and pharmaceutical preparations. Fucoidan and other polysaccharides from the fucans group found applications in many fields, including medicine, cosmetics and pharmacy. Their particularly valuable features include anti-inflammatory, antiviral, antioxidant, anti-cancer and regenerative properties on the skin. The conducted research will allow to verify the research hypothesis regarding the effect of fucoidan on the stabilizing properties of different oxide suspensions

In order to obtain order to obtain the detailed description of the stabilization properties of the studied systems, it is also necessary to gain the information about its adsorption properties. Based on the conducted measurements, it is possible to determine whether the used polymer is adsorbed or not on the solid surface. This information will allow to determine which mechanisms of stabilization (or destabilization) occur in the studied systems. It is planned to investigate the adsorption of the used polysaccharide on the oxide surface using a spectrophotometric method. The main part of this project will focus on the investigation of stability of described systems. In this case, a turbidimetric method will be used. In addition, it is planned to perform the electrophoretic mobility measurements and the surface charge density measurements, which will allow for even more accurate description of the properties of the studied systems. As a result of the research, hybrid materials with a possible cosmetic and pharmaceutical applications may be created. Therefore, it is planned to study the obtained materials in order to determine their thermal stability and changes in their surface structure using fourier-transform infrared spectroscopy and thermogravimetry. It is also planned to prepare SEM images of the obtained materials.

Despite of the growing interest in the use of natural polymers as stabilizers of the colloidal systems, according to the author's best knowledge the influence of fucoidan on the stabilizing-flocculating properties of aqueous oxide suspensions has not been studied before. The reason for undertaking the proposed research task is to obtain a system in which the used bioactive substance with proven health-promoting properties also acts as a stabilizer. This action can bring huge benefits because there is no need to use the additional stabilizing substances. This can lead to the reduction of costs of preparation of such system, but will also allow to eliminate the synthetic compounds with much lower biocompatibility. The idea of preparing systems containing fucoidan as a stabilizer as well as an active substance is an innovative research idea. Therefore, the conducted experiments will enrich the existing knowledge in the field of physicochemistry and colloid chemistry, concerning the use of natural biopolymers for the stabilization of colloidal suspensions.