DESCRIPTION FOR THE GENERAL PUBLIC

Surfactants (surface active agents) are substances which, thanks to the presence of hydrophilic and hydrophobic moieties in their molecules, have the ability to accumulate between phases with different properties and to reduce surface and interfacial tensions. This leads to the formation of micelles, and consequently - permanent emulsions or foams. However, not all amphiphilic compounds have this ability – it depends on the mutual ratio of hydrophilic and lipophilic groups in the surfactant molecule (referred as HLB). Compounds having a significant advantage of hydrophilic groups (HLB = 20) or hydrophobic (HLB = 0) lose their ability to form micelles. Emulsifiers should preferably an HBL of 3 - 6 in case of W/O emulsifier and an HLB of 8 - 12 in case of O/W emulsifier.

Surfactants are amphipathic molecules consisting of a polar "head" and a hydrophobic "tail". Classical surfactants are based on petrochemical and oleochemical raw materials and are produced on a large scale for industrial purposes, particularly as detergents and surface cleaners. Enzyme surfactants exhibit typical surface-active properties and can act as emulsifiers. Unlike conventional surfactants, they are less toxic, more biodegradable, have better environmental compatibility, and are more stable. The most commonly used methods for obtaining ecologic surfactants are: esterification and enzymatic transesterification of fatty acids, and glycerolysis of fats and oils, with the presence of 1,3-specific lipases.

Emulsions are two-phase systems which are a mixture of two solutions with different properties. The first phase has a hydrophobic nature, while the second - hydrophilic. Such system is not generally stable, and in order to enhance the stability, it requires the presence of compounds that reduce the line-to line voltage, internal energy or compounds that inhibit the connection of particles of the dispersed phase. Important elements influencing the stability and rheological properties of emulsions are the size, concentration and distribution of molecules of dispersed phase.

One way to increase the stability of the emulsion is to add the so called emulsifiers and stabilizers, whose role is, among others, increasing the viscosity of the continuous phase or preventing aggregation of the oil droplets. Stabilizers are normally biopolymers, such as proteins or polysaccharides.

Maltodextrins are the products of starch hydrolysis and they are widely used in the food production industry. They have strong hydrophilic properties and are almost completely soluble in water. They are not particularly surface-active, and so their main stabilizing action in oil-in-water emulsions is believed to be through viscosity modification or gelation of the aqueous continuous phase surrounding the oil droplets. Therefore, emulsions containing maltodextrins, as stabilizers, require an additional emulsifying agent for the production of a stable emulsion.

By modification, new functional groups with hydrophobic properties can be introduced into the anhydroglucose units, thus providing a saccharide amphiphilic character. Changing the physico-chemical properties of the polysaccharide could eliminate the need for an additional surfactant stabilizing the emulsion. Proper selection of the concentration of esterified maltodextrin will allow to replace a number of compounds used to stabilize the emulsion with one environmental agent to improve the structure of the emulsion and delay the resolution.

The objective is to design and obtain new, ecological surfactants with emulsifying properties, based on potato maltodextrins and unsaturated fatty acids, impact assessment of the obtained surface active agents on the possibility of effective and durable stability of the emulsion, and to investigate the rheological properties of the obtained o/w emulsion.

In the basic research, in addition to the already mentioned development of synthesis of methodology of potato maltodextrins with different degree of saccharification with long-chain fatty acids and preparation of emulsions based on the products of esterification, physico-chemical analysis of the resulting products will be carried out, including FTIR and NMR spectroscopic analyses, thermal analysis DSC/TG/DTG, solubility tests, determination of surface tension, measuring of the pH of 1% solutions of the products, viscosity characteristics using the RVA analyzer, elemental analysis, morphological studies with the use of a scanning electron microscopy SEM, visual and microscopic assessment of emulsions, surface active compounds determination of creaming index (CI) and examination of the rheological properties of emulsions (including texture profile analysis or tests on viscoelastic properties) and phytotoxicity test.

Obtaining new products, which are esters of maltodextrins with acids contained in oils, brings in new possibilities. Therefore, it requires a better understanding to develop methodology, as well as examine the properties of the obtained compounds. Esterification products may play a crucial role in the preparation of stable O/W emulsions, without the need of additional stabilizer.