Foams and emulsions are one of the largest group of dispersed systems, which is widely used in industrial and technological applications, as well as everyday life. Mineral processing, cosmetic and food industry, firefighting and household products (detergents) are only few examples of enormous demand of foams and emulsions. Such systems are composed of swarm of bubbles or droplets (oil or water), suspended in the continuous phase and separated by thin liquid layers. To stabilize the system and prevent the bubbles and droplets from coalescence (eating each other) it is necessary to use surface-active substances to create sort of protection coat around each bubble or droplet surface, which stabilizes intervening layers of the continuous phase (liquid films). Synthetic surfactant with relatively high decomposition time in the natural environment are the most commonly used substances for these purposes. Enormous demand for foam and emulsion products causes that this type of surface-active substances significantly contributes to natural environment contamination by eutrophication of water reservoirs, toxic behaviour in respect to aqueous flora and fauna due to accumulation in living organisms and pollution of drinking water reservoirs, causing drinking water shortage. Due to this fact, it is urgently necessary to search for new, effective but simultaneously biodegradable and environmental friendly surface-active substances, which are able to effectively stabilize the dispersed systems, and trigger their desired properties. Proteins, lipid derivatives and natural polyelectrolytes are very promising candidates for these purposes. Such substances are environmental friendly and are capable to adsorb at interfaces and stabilize the liquid films. Nevertheless, they are also difficult to investigate, especially under dynamic conditions, i.e. closest to the real conditions of the dispersed systems formation, due to long time needed to establish desired degree of adsorption coverage at the investigated interface (low value of diffusion coefficients). This is the main reason that the fundamental researches are needed for quantitative description of kinetics of drainage of symmetrical liquid films in solutions of bio-surfactants, during which it will be possible to precisely control the time and degree of formation of the adsorption layer at the bubble and/or droplet interfaces.

The presented research project is aimed to investigate potential application of bio-surfactants (proteins, lipids derivatives, natural polyelectrolytes) as new, effective and environmental friendly stabilizers of foam and emulsion films under dynamic conditions. Scientific tasks planned within the project framework will be performed according to the new methodology and by use of the new experimental set-up elaborated, allowing quantitative description of kinetics of drainage of single symmetrical liquid films (foam and emulsion), formed at the liquid/gas and liquid/liquid interfaces by the colliding bubbles and /or droplets in solutions of biodegradable and environmental-friendly surfactants. The investigations, therefore, will be focused on basic and fundamental phenomena underlying formation, stability and properties of foams and emulsions. The main focus will be put on direct measurements of rate of thinning of a single foam and/or emulsion film, formed under dynamic conditions, in order to determine factors affecting kinetics of drainage and critical thicknesses of rupture of liquid films (i.e. coalescence of bubbles and droplets) in solutions of biodegradable surface-active substances. The aim of the project is to perform systematic studies, which allow to determine foamability and emulgability of substances having unique properties and capability to be “green” alternative to commercial and stable chemical substances.