The project, which fundamental goals are described below, is related to the chemistry of dispersed systems, which defines among others, the stability and structure of foams and emulsions. These are particularly significant forms of dispersed systems which vast diversified applications and useful properties are determined by their structure, the type of stabilizers employed in their manufacture, as well as intermolecular interactions, and adsorption kinetics. Emulsion or foam is a system composed of a large number of small droplets or bubbles separated by thin layers of liquid, preventing them from contacting and fusing (the so-called coalescence). The stability of such systems is thus closely tied to the rate of their rupture. Surfactants are substances that prevent them from undergoing this process while still providing them with necessary functional qualities.

The above-mentioned bubbles and droplets are kept in control by surfactant modification of surface characteristics, which may be quantified by measuring the so-called interfacial tension. This is due to surfactants forming a protective film on the surface (the so-called adsorption layer). Amino acid surfactants (AASs) have been reported as environmentally friendly compounds that can act as stabilizers. In addition to their “green nature”, one may modify properties of bubbles and droplets interfaces in foam or emulsions by modifying the pH of aqueous phase. Magneto-reactivity, for example, can be introduced by the employment of specific magnetic nanoparticles, which combined with amino acid surfactants, generate synergistic NPs/AASs combinations.

The project's major purpose is to investigate the effect of a magnetic field on a single thin liquid film stabilized by magneto-reactive synergistic mixtures of AASs and NPs, as well as the system of such films forming much more complicated real foams. The suggested experiments involve systematic determination of the stabilizing properties via measurements of surface tension and time evolution of foam films thickness (drainage kinetics). These two scientific approaches used for simple, model systems are critical in forecasting the features of more complicated foam systems. During the preliminary research, it has been revealed that the magnetic field had a substantial impact on both the interface characteristics of adsorption at liquid/gas and the rupture rate of a single foam film formed by NPs/AASs stabilized bubble in a magnetic field. In future tests, the rate of decay of the foam stabilized by magneto-reactive surfactants in a magnetic field will be investigated. The results of preliminary studies show directly a necessity of further scientific efforts for more detailed explanation of the film's drainage process both in model and real systems under consideration. The project's research goal is to identify the effect of an external magnetic field on the adsorption processes of AASs/NPs solutions and to define the repercussions of its existence in the kinetics of drainage of thin liquid films. This will allow to elaborate the fundamentals of a methodology, which will allow to design a way of targeted destabilization of more sophisticated systems, such as real foams and emulsions.