Wastewater in the oil recovery industry is usually an intricate system containing oil, water, surfactants, as well as different kinds of solid inorganic particles. The treatment of oily wastewater is constantly improved in order to reduce oil losses, to reuse water and protect the environment. The break-up of such emulsions is one of the major concerns for economic and environmental reasons. This process is difficult to standardize mainly due to the complexity of the system. The present study is focused in the preparation of an oily sludge model as a means to evaluate the efficiency of polyelectrolytes as flocculants in a controlled and stable system that assimilates the industrial oily sludge [1, 2]. The oily sludge contains crude oil, natural surfactants, water and solid particles in various proportions depending on its origin.

Clay minerals are known to stabilize oil in water emulsions. A mixture of natural inorganic minerals (Blauton-clay) that consists of kaolinite (65%), illite (20%), montmorillonite (3%) and quartz (12%) has been used for the preparation of emulsions in the presence (suspoemulsions) and in the absence (pickering emulsions) of surfactant. Blauton clay is included in industrial oily sludge. In the present work Blauton clay was studied with respect to the effect of surfactant and polyelectrolytes in order to comprehend the interactions between these components and draw conclusions on the effect of the clay on the 5-component system (water/oil/clay/surfactant/polyelectrolyte). The use of a 3-parameter model (water/surfactant/clay and water/polyelectrolyte/clay) is necessary for the simplification of the study, since a 5-parameter model would be difficult if not impossible. The stability of the emulsions in the presence of Blauton is high and the separation of the clay of such emulsion is difficult. In the case that a surfactant like sodium dodecyl sulfate (SDS) is present the separation is even more complicated. The necessary amounts of flocculant (polyelectrolyte) are ten times higher. Dispersions of the clay in water, water+SDS and water+polyelectrolyte were characterized by means of laser diffraction, particle shape analysis and dynamic light scattering. In addition, Zeta potential versus pH and surface electrical properties were measured using a PCD 03 particle charge detector (Mütek, Germany).

The synthetic and natural polyelectrolytes like chitosan anf modified chitosan were evaluated in terms of flocculation efficiency, flocculation window, restabilization, floc size and strength, turbidity of the supernatant after flocculation and flocculation velocity. In addition the last part of this section reports on the quality of the recovered water depending on the polyelectrolyte used for the flocculation.