DESCRIPTION FOR THE GENERAL PUBLIC

The scientific aim of this project is to gain knowledge on reactions of selected groups of chemical compounds taking place in cavitation conditions in aqueous and non-aqueous environment. During the implosion of cavitation bubbles, a focused energy and resulting high temperature allows to effectively degrade many chemical compounds present in the cavitated liquid phase. The main reactions taking place in the cavitation zone are reactions of thermal decomposition of chemical moieties as well as oxidation reactions with dissolved oxygen and hydroxyl radicals produced in this conditions. The studies will be done for groups of chemical compounds which are a pollutants commonly present in aqueous environment (industrial effluents, in particular refinery effluents) and non-aqueous (liquid process streams and products of chemical industry) – organic and inorganic sulfur compounds (sulfide ions, sulfides, thiols, thiophen derivatives), nitrogen compounds (ammonium ions, amines, pyrrole and pyridine derivatives), oxygen compounds (carboxylic acids, ketones, aldehydes, alcohols, eters, including furan and phenol derivatives), aliphatic, cyclic and aromatic hydrocarbons, including BTEX compounds as well as polycyclic aromatic hydrocarbons.

For some time the cavitation phenomena started to be an interesting object of research in the scope of its usage as a new “branch” of processes in chemical engineering and technology. A recognized as a destructive and strongly undesirable phenomena in the industry, due to its destructive activity to the fittings of the process installations, revealed to be possible to be used in positive manner as a source of energy for chemical reactions. In recent years intensive scientific research has been made mainly for applications from the group of Advanced Oxidation Processes (AOPs), in particular for wastewater treatment [1-5]. Some papers reported also the possibility of its usage for desulfurization of fuels [6-8]. The advantage of reactions assisted by cavitation is the possibility of focusing a large amounts of energy in the reaction place, which drive to obtain a local increase of temperature even to a few thousands K and pressure of 1000 atm. The process conditions are difficult to obtain in different way and allows to perform effective chemical reactions.

This project is in the scope of current topics in the worldwide science on the research of chemical processes in cavitation conditions. A studies planned in this project will substantially increase the knowledge on cavitation phenomena and mechanisms of chemical reactions undergoing in this conditions.