# Second Stage Summary

The IMAWATCO project consortium has based its research on the idea that some of the most efficient water purification materials are absorbent charcoal, polymer membranes and natural zeolites. Therefore, it proposes a filtering installation with these 3 components.

The role of the treatment plants is to retain inorganic and organic contaminants from wastewater. In general, such a plant will include a first layer of natural zeolites as the first stage of depth filtration and purification, a second layer consisting of polymer membranes for ultra filtration and selective adsorption and a final layer of activated charcoal, for the complete purification of wastewaters. In this manner it is provided an enhanced absorption capacity for the various pollutants in water: insecticides, surface-active agents, metal cations, ammonium ions, hormones, etc.

Research within the BS-Eranet project are clearly defined between partners: Technical University of Istanbul is handling the zeolite layer, Institute of Organic Chemistry, and the Institute Solar-Terrestrial and Space (both included in the Bulgarian Academy of Sciences) are working on the activated carbon layer and project coordinator ICECHIM INCDCP – deals with multifunctional polymeric membrane and the realization of the final kit.

Research carried out by INCDCP-ICECHIM in the second phase of the project BS-Eranet-7-045/2011 IMAWATCO had the purpose to develop polymeric membranes using binary mixtures based on acrylic copolymers (acrylonitrile - vinyl acetate indexed as AN-AV) and hidrosoluble polymer (PHS). Three copolymers AN-AV were prepared using different concentrations of AV. In order to obtain the polymeric membranes, some solutions in DMSO were prepared first by dissolving appropriate quantities of acrylic copolymer and PHS –its use being justified by the need to introduce groups on the membrane surfaces, which would be made available in the enzyme covalent immobilization reaction. Obtaining the polymeric membranes was done through the process of coagulation of the polymeric solutions previously prepared in a coagulation bath consisting of either non-solvent or different solvent-non-solvent mixtures.

Research has shown that the best rate of coagulation is achieved by the use of solvent-non-solvent mixtures. Membranes were functionalized before enzyme immobilization. The functionalization reaction happens at PHS-level. We studied the effects of functionalized polymer membranes and of the enzyme covalent immobilization on the chemical composition of the membranes, the thermal behavior and their hydrophilic character.