The continuous growth amount of organic contaminants impacting environmental degradation is one of the major consequences that people pay for civilization and economic development. The occurrence of pharmaceuticals, dyes and surfactants in aquatic environment is a global problem. Especially concerning issue is presence of antibiotics due to their properties may promote the antibiotic resistance in pathogens. The surfactants and dyes can live long in water cause to prolong the water treatment and purification process. Therefore, these organic contaminants also pose a risk. Among the available methods for removing organic contaminants, adsorption methods deserve attention. The special attracting solution is to use mineral and wasted materials (sorbents), which are characterized mainly by high porosity, ion exchange or hydrophilic-hydrophobic properties. However, the use of sorbents in environmental applications requires their granulation. Moreover, various parameters, including granulation process, affect on quality and reactivity of granulated sorbents. In order to improve sorption properties of granulated sorbents, the functionalization by used acid conditioning (inorganic acid) could be applied.

The aim of this project is design stable, acidic conditioned granulated mineral sorbents and determine their sorption properties in fixed-bed column system. Obtained data will provide information on the application opportunity the granulated sorbents as the materials capable of effective removal dyes, pharmaceuticals and surfactants from contaminated water. Furthermore, it will be possible to identify in detail, the sorption mechanisms responsible for immobilization of organic contaminants on surface of granules under dynamic conditions. The experiments will be carried out using the following granulated materials: halloysite, fly ash, halloysite-fly ash, bentonite, lignite, bentonite-lignite. At first step, the granulation process of sorbents will be performed. The next step will be acid conditioning of granules. Obtained granulated sorbents will be investigated at the batch sorption studies. Finally, the fixed-bed column tests will be performed, where the effect of initial concentrations, flow rate of sorbate and bed depth (sorbent dosage) and granule size will be determined. The regeneration tests will be conducted for selected samples obtained after sorption reaction in fixed-bed column system. Analysis of the properties of solids (before and after acidic conditioning as well as after sorption) enable to describe impact of the granulation andconditioning process on changes of sorption properties and determine the mechanisms responsible for immobilization of dyes, pharmaceuticals and surfactants onto granulated sorbents.

The obtained results will allow explaining thus far unknown mechanism of sorption of dyes, pharmaceuticals and surfactants which commonly coexist in contaminated water. Moreover, collected research data will be useful for development effective method of immobilization of organic compounds using granulated sorbents in fixed-bed column system.