Water needs to be properly treated before it reaches our taps. Underground water is mainly polluted by iron and manganese compounds. The basic technology of purification of this type of water is based on the removal of iron and manganese compound by the use of aeration and filtration. The product of such processes is called ferruginous sludges because it contains a large amount of iron. The objective of this project is to determine the phase, chemical composition, and physicochemical properties of ferruginous sludges. The secondary aim is to explain the variability of the sludges' composition and properties, both of which depend on the chemical composition and physicochemical properties of the water from which the sludges precipitates. Sorption capacities will be evaluated with respect to heavy metals and gases. The main objective will be to describe the sorption mechanisms and determine whether the sludges can potentially be used in environmental protection to remove pollution from water and air.

It can be assumed that the chemical composition and properties of ferruginous sludges vary significantly, possibly due to the chemical composition of the water from which the sludges are generated, as well as the geological and hydrological structure of the given area. The sorption experiments will consider the influence of the initial concentration of metals, pH, reaction time and temperature. This will allow the reaction nature and sorption mechanism to be determined. Desorption experiments will provide information about the stability of immobilization of the compounds in the sludge. Removal of gases - hydrogen sulfide will be carried out, taking into account the influence of reaction time.

The obtained results will complete the gap in the knowledge about ferruginous sludges. There are many publications characterizing sludges from surface water treatment. Ferruginous sludges from underground water treatment has not been definitively examined. There are still missing data precisely describing the composition and properties and explaining the differences in the nature of individual sludges. It is well-known that ferruginous sludges have great sorption capacities, but these have not been explained. There are no sorption experiments that have considered a wider range of metals that commonly pollute water. There are also no studies about sorption experiments of gases onto ferruginous sludge. It is not known whether the adsorbed contaminants will be immobilized permanently. All these unexplained issues are the reason for instigating this research.