

Human activity is currently associated with the emission of many pollutants into the environment. Pollutants can not only negatively affect living organisms present in the environment, but also induce many civilization diseases (e.g. cancer). Thus, it is necessary to remove the pollutants at the source, and if it is not possible to neutralize of it at the place where the contamination exists. For the cleanup of the environment, waters or soils, new materials are produced based on the latest technologies (e.g. nano). Biochar has been very popular in recent years. Biochar can be produced from waste materials (organic waste, waste biomass), which contributes to their utilization. In addition, biochar production is a known and accepted way to reduce CO₂ emissions to the atmosphere. Biochar that has undergone specific modification may be used to remove contaminants from water or remediate soils and sediments.

Tailored biochars of this type, designed for specific functions, are referred to as engineered biochars (EngBC) or “smart” biochars. The literature does not provide important information related with the environmental risk concerning EngBC. Information of fundamental importance for safe use of EngBC – not researched till now – includes 1) determination of their toxicity and content of native contaminants after the process of modification/activation, 2) determination of the force of their interaction not only with the contaminants which are their target, but also with other contaminants occurring in the environment as well as with natural soil/sediment components, and 3) determination of their stability in soils as a result of various environmental processes referred to as ageing.

Therefore, in the situation of the growing interest in the use of EngBC, it is extremely important to acquire knowledge on their ecotoxicological properties and transformations due to ageing, and the resultant potential consequences to the environment. This will allow to reduce the potential risk and to produce engineered biochars following the rule of sustainable development and safe to the environment. Hence, the overarching objective of the project will be the estimation of the effect of various processes of modification biochars (most frequently described in the literature) on their property and reactivity, and consequently their toxicity and stability. Their reactivities will be characterized by both physical and chemical reactions with various soil components (organic matter, nutrients) and with contaminants potentially occurring in soil.