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Production and characterization of carbonized sorbent products optimized for anionic contaminants

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Processing conditions, production methods and feedstock characteristics have been shown to affect the final sorption properties of biochar-based sorbents that have been produced in pyrolysis reactors. The content of O-containing carboxyl, phenolic and hydroxyl functional groups on the biochar surfaces plays a crucial role in sorption chemistry of hazardous materials. The sorption process can be affected by the presence of non-carbonized fractions in biochar matter as well. All these characteristics indicate that biochar shows good potential as a new tool in removal and separation technologies of various pollutants from waste water or contaminated soils.

The sorption potential of wood-based biochars for cationic forms of heavy metals has been studied intensively and has already led to successful pilot applications in the field. However, anionic compounds (e.g. phosphate, nitrate, sulphate, As-, Cr-compounds) do not sorb well to unmodified biochar and need specific surface modification of biochar.

Based on this fact, we try to obtain data about the sorptive separation of anionic forms of various contaminants from model aqueous solutions by different types of biochar-derived sorbents, or mineral-enriched biochar-derived sorbents. An important part of this research is the assesment of the effects of varying process parameters during biomass carbonisation, the role of biomass feedstock and pre-and/or post-treatment of the biochars onto sorption processes. We specify the most appropriate application strategies with biochar for remediation purposes of waste water or contaminated waters with elevated toxic metal concentrations that might compromise the quality of surface waters. The main aim of research is the preparation of modified biochar sorbent, the characterization of its surface and the investigation about new possibilities of modified biochar sorbent applications for sorption of various contaminants, mainly their anionic forms (e.g. phosphates, nitrates, arsenates). Modification of bamboo-based biochar with clay minerals, the preparation of its composites, could increase the surface area of bamboo-based biochar from 3 to 5 times. Other ways of modification e.g. by using $FeCl_3 \cdot 6H_2O$ caused a significant increase of sorption ability for anionic forms