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Preliminary Evaluation of Sewage Sludge Biochar Composition and Mass and Energy Balance of the Sludge Pyrolysis.

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Preliminary Evaluation of Sewage Sludge Biochar Composition and Mass and Energy Balance of the Sludge Pyrolysis

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Biochar is a solid material obtained from the thermochemical conversion of biomass in an oxygen-limited environment.¹ Biochar can be used, for example, as soil amender/conditioner, or active carbon adsorbent. Its production sequesters carbon into a stable form, therefore it mitigates greenhouse gas emissions. Based on the feedstock biomass material and biochar properties, biochar for soil application may be classified as fertilizer, liming material, soil improver, growing medium, agronomic additive or plant biostimulant.²

With regard to a relatively high content of nutrients (N, P, K, Ca, Mg), sewage sludge is a potentially suitable material for biochar production by pyrolysis and the produced biochar may be considered as a fertilizer. Due to thermal treatment, sludge biochar contains significantly low-to-no amounts of pathogens and organic (micro)pollutants, which are recently of concern in terms of the agricultural use of sewage sludge. In addition, pyrolysis, together with combustion and gasification, is a highly convenient treatment route for sewage sludge since it leads to a remarkable volume reduction of the waste.³

The pyrolysis experiments were performed in a quartz reactor, nitrogen being supplied to attain oxygen-free atmosphere. Sewage sludge from Brno-Modřice municipal wastewater treatment plant was pyrolyzed at temperatures 400, 500, 600, 700 and 800 °C. Biochar (solid residue), liquid (tar) fraction, and pyrolysis gas were weighed and analyzed to obtain the mass and energy balance and to describe the basic properties of biochar. With an increase in pyrolysis temperature, biochar yield decreased from 61% (400 °C) to 46% (800 °C), which is attributed to more organic material decomposition at higher temperatures. Consequently, the gas yield increased. Soil nutrients (P, K, Ca, Mg) that are mostly bound to thermally more stable mineral fraction were concentrated in the biochar.

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