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Physico-Chemical Properties of Sludge-Char

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Sewage sludge has been used for fertilizing purposes to a great extent throughout past decades, however, its use for such purposes has already been widely limited or fully restricted in many countries. Application of sewage sludge from municipal wastewater treatment plants on soil is reasonable because of high content of organic carbon and other nutrients, preferably phosphorus and nitrogen. On the other hand, it is often polluted by unwanted heavy metals, pathogens, and other organic pollutants and their residues (POPs, pharmaceuticals and personal care products) which are of a concern lately. To utilize the sludge for production of fertilizers or P-recovery technologies, it shall be wisely treated to suppress its above mentioned negative properties. Thermal treatment (pyrolysis, gasification, combustion) of the sludge is promising way to get rid of organic matter - including organic pollutants - with possible energy recovery. In addition, solid process products (ashes, chars) can be reprocessed for P-recovery to produce fertilizers¹ or can possibly be directly used as fertilizer and/or soil conditioner to improve plant growth².

Compared to woody and agricultural biomass, sewage sludge exhibits very different properties (e. g. high water, ash, and nitrogen content) suggesting some peculiar features of the process products, preferably of solid residues from pyrolysis and/or gasification. We studied pyrolysis of dry stabilized sewage sludge in a fixed bed reactor at temperatures 400, 500, 600, 700 and 800 °C in inert helium atmosphere. The material and energy balances were evaluated and the sludge-chars were analyzed by multiple analytical tools to evaluate their physical and chemical properties.^{3,4} Additional spectroscopy analyses were performed on sludge-chars to prove some hypotheses based on basic characterization and to study suitability of the techniques for studying such materials.

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References

1. Adam, C.; Peplinski, B.; Michaelis, M.; Kley, G.; Simon, F.-G. Thermochemical treatment of sewage sludge ashes for phosphorus recovery. *Waste Manage.* **2009**, *29*, 1122–1128.
2. Faria, W.M.; de Figueiredo, C.C.; Coser, T.R.; Vale, A.T.; Schneider, B.G. Is sewage sludge biochar capable of replacing inorganic fertilizers for corn production? Evidence from a two-year field experiment. *Arch. Agron. Soil Sci.* **2018**, *64*, 505–519.
3. Moško, J.; Pohořelý, M.; Skoblia, S.; Beňo, Z.; Bičáková, O.; Václavková, Š.; Šyc, M.; Svoboda, K. Batch Reactor Pyrolysis of Stabilized Sewage Sludge: Product Analysis and Sulphur Balance. *WIT Trans. Ecol. Envir.* **2019**, *231*, 357–365.
4. Moško, J.; Pohořelý, M.; Skoblia, S.; Beňo, Z.; Brynda, J.; Zach, B.; Šyc, M.; Václavková, Š.; Jeremiáš, M.; Svoboda, K. Properties of Biochar Produced by Slow Pyrolysis of Stabilized Sewage Sludge. *European Biomass Conference and Exhibition Proceedings 2017*, 1340–1342.