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Return of phosphorus in agricultural residues and urban sewage sludge to soil using biochar from low-temperature gasification as fertilizer product

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Abstract

The return of residual products from bioenergy generation to soils is a step towards closing nutrient cycles, which is especially important for nutrients produced from non-renewable resources such as phosphorus (P). Low-temperature gasification is an innovative process efficiently generating energy from different biomass fuels, such as agricultural residues and waste streams, and at the same time producing a biochar product potentially valuable for soil amendment. In pot experiments, different residual products originating from low-temperature gasification were tested for their P-fertilizing potential with spring barley as a test crop. Biochar resulting from gasification of pure wheat straw showed the best P fertilizer value, however, because of the low P content, extremely high amounts had to be applied when crop P demand should be met, which came along with an over-fertilization of potassium (K). Gasification of pure sewage sludge with a high Fe and Al content practically eliminated its P fertilizer value, while co-gasification of sludge lower in Fe and Al together with wheat straw resulted in a biochar product with only somewhat reduced P availability and improved P/K ratio for fertilization purposes. Operationally defined P pools in soil obtained by sequential chemical extraction of the biochar-amended soils could be related to the observations made in the pot experiments. The results emphasize the potential of combining different feedstocks for thermal conversion processes when aiming at improving the usability of the residual products.

Preferred: Poster presentation

Kommenterede [hnie1]: Eneste kommentar er at hygiejniseren er udeladt, og det syntes jeg er ærgeligt. Det peger fremad, viser nye muligheder som bør undersøges nærmere – det kann måske give dig nogle gode kontakter til fremtidige ansøgninger?!