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Properties and use of high-temperature biochar

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Despite being a hot topic in environmental research, biochar and its properties have been mainly investigated from the perspectives of feed-stock type and pyrolysis temperature. Few studies have explored the effect of particle size on biochar properties.¹ Even when the effect of particle size on crop efficiency is recognized, there is a lack of corresponding data and analysis.^{2–7} Therefore, we thoroughly analyzed (proximate and ultimate analysis, SEM, XRD, Raman spectroscopy) four particle size fractions (< 0.5, 0.5–2, 2–5, > 5 mm) of high-temperature biochar from a gasification power plant, the sizes reflecting those of biochar actually used in agriculture. The < 0.5 mm fraction was significantly different in terms of carbon structure, and carbon and ash content; consequently, pH, electric conductivity and heavy metal content also differed greatly. The corresponding results for the other particle fractions were broadly similar to each other. Interestingly, for all fractions, the porosity and H/C ratio were independent of particle size, meaning that, regardless of size, the investigated biochar fractions are equally stable in soil. The 0.5–2 mm fraction was then selected to be used in different industrial or agricultural processes such as the anaerobic digestion of wastewater or livestock feeding. The effect of biochar on these processes is currently under investigation, providing only initial data so far.

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