Revisiting biochar valorisation potentials

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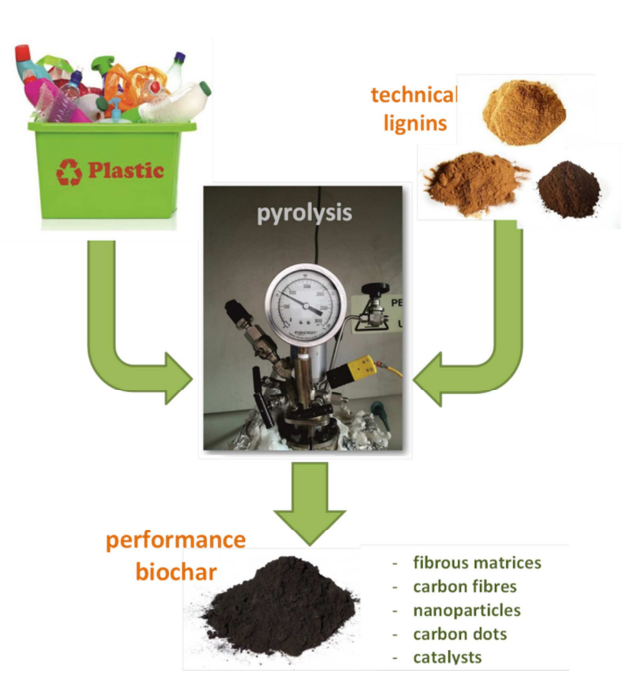
Conversion of biomass into biochar *via* pyrolysis processes is a common approach in biomass valorisation, since both the components in the condensed phase as well as the char residues eventually represent higher value materials than the starting biomass. Processes are commonly optimised looking at the gaseous components, neglecting the formation process of the biochar and thus its characteristics, ultimately artificially limiting its valorisation potential.

Our collaborative project revisits biochar formation from technical lignins, including detailed characterization not only of the condensed phase, but also of the solid phase. Preliminary results generated suggest that it is possible to tune biochar formation conditions such as to produce materials from lignin that are not completely depleted in lignin-typical motifs and/or lignin-typical functional groups, especially oxygen-containing functionalities, and hence still comprise the possibility to perform subsequent valorisation steps towards higher value-added products.



Process parameters are optimised for favouring formation of 'reactive' biochar, and tuning of biochar formation includes the use of binary mixtures of technical lignins and used polyethylene and polypropylene, such as to arrive at structural characteristics not achievable using only one of the components. The 'reactive' biochar such as to produce starting materials for the formation of high value-added performance materials, including electrospun fibrous mats and nanoparticles, eventually transformable in carbon fibre mats and carbon dots, respectively. 'Reactive' biochar is tested with respect to the production of char that redox-actively binds metal components, for applications as catalysts.