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Influence of Pyrolysis Residence Time on The Physicochemical Properties of Algal Biochar for Water Treatment

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Access to clean water have been a growing problem for both developed and underdeveloped countries. To curtail this growing problem, water treatment must be considered. Conventional methods such as chemical precipitation, ion exchange, adsorption (using activated carbon), and membrane separation processes are applied in the removal of contaminants from water. These methods are costly and often generate considerable amounts of chemical residues, which have no economic value.

Biochar derived from the pyrolysis of various biomass has shown to be a promising material for water treatment. Biochar can be produced from a wide range of feedstock including plant and animal wastes, domestic and municipal wastes, agricultural waste, and more recently algae (seaweed).

The influence of pyrolysis temperature on the physiochemical properties of biochar has been studied and well established (Frota et al., 2022, Wang et al., 2020). In contrast, less attention has been paid to the effect of the residence time on these physicochemical properties.

This work is focused on the impact of pyrolysis residence time on surface and chemical properties of Ulva rigida algal biochar (URB). Residence times of 15min, 30min, 45min, 1hr, 1hr:30min and 2hr, and at a fixed temperature of 600oC. We studied the Ulva rigida (UR) algae which is a seaweed that thrives in polluted shallow worldwide.

We aim to understand the influence of above residence times on the surface and chemical properties of the algal biochar such as composition, morphology, crystallinity, surface area, pore size distribution, change in aromaticity and polarity by TGA/DSC, SEM, EDX, XRD, BET and FTIR measurements. As earlier reported by other researchers increased residence time had significant effect on biochar physicochemical properties. It was found to increase the surface area, porosity, pH, and ash contents of biochar but decreased C, N and H contents. Prolonged residence time resulted in collapse of pore structure and decreased surface area (Sun et al., 2017, Wang et al., 2020).

This study would investigate if the above pattern of surface and chemical properties will be retained by Ulva Ridiga biochar (URB) which will aid in our future studies such as biochar selection, process time and pyrolysis temperature optimization for a better material design of water treatment.

Participation

In-Person

References

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Primary authors: Ms ODIKI, Esther (Teesside University); Prof. PAK, Tannaz (Teesside University)

Presenter: Ms ODIKI, Esther (Teesside University)

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