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Evaluating river driftwood potential for energy storage applications

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Around the world rivers transport large volumes of driftwood into lakes, seas and oceans. Recruited commonly during flooding events and transported by rivers, driftwood poses a hazard for the point of view of the safety of infrastructures and river dwellers. For that reason, it is many times extracted locally and stored; driftwood removal prevents sinking and protects the dam infrastructure. Collected driftwood is a neglected river resource that is generally combusted or landfilled. Génissiat dam on the Rhone River in France presents a case study where annually approximately 1300 tons of driftwood is intersected.

Among the different processes that are capable of converting driftwood, HydroThermal Carbonization (HTC) is of high interest due its ability to process biomass with high moisture content, such as driftwood. HTC of biomass leads to the production of a solid product referred to as hydrochar, which is a high added-value material that can be used in different applications, such as fuel cooking, soil amendment, water treatment and energy storage. The goal of the study was to characterize the driftwood collected upstream of the Génissiat dam and to investigate its potential for hydrochar production as precursor of anode in sodium-ion batteries. Sodium-ion batteries have received more interest lately as an alternative for the resource intensive and expensive lithium-ion batteries. The study follows a novel approach in study driftwood by categorizing based on their genera. HTC of the different identified genera was conducted in a 2L batch reactor following a temperature of 200 °C for a residence time of 11.5 h. Results show that the impact of driftwood genera is not significant for processing of driftwood through HTC. Produced hydrochar had a high carbon content (from 55.4 to 57.0 %) and lower ash content (from 0.2 to 1.4 \% of dry biomass). Electrochemical results show that driftwood-based hydrochar is a promising precursor of hard carbon anodes in sodium-ion batteries due to its excellent electrochemical performance.

Key words: Driftwood, Hydrothermal carbonization, Hydrochar, Rhone river, Sodium-ion batteries