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Co-hydrothermal treatment of fallen leaves with iron sludge to prepare magnetic iron product and solid fuel

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The hydrothermal carbonization (HTC) was performed on *Metasequoia* Leaves (ML) in the presence of iron sludge, both of which were generated as solid residuals. The relations between sludge, char's properties and operating conditions were systemically investigated. Iron sludge primarily catalyzed the efficient formation of char with higher heating value (HHV) becoming 1.15-1.65 times of ML (18.21 MJ/kg) and was meanwhile reduced to magnetite. The hydrated Fe ions in octahedron crystals acted as nucleophiles facilitating the dehydration and decarboxylation reactions. The increased HHV is found strong temperature dependent while prolonging the residence time is more preferable for low organic acids generation. Thermogravimetric analysis confirmed the iron sludge enhanced conversion of volatile to fixed carbon. The as-prepared solid char showed better stability after catalytic HTC treatment, having ignition temperature increased from 253 to 426°C as compared to the char prepared without iron sludge addition.

Key words: *Metasequoia* Leaves; Hydrochar; Iron Sludge

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