Intensification par micro-ondes de la pyrolyse de sargasse.

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Abstract
The objective of this thesis is the valorization of sargassum through microwave-assisted pyrolysis using monomode microwaves, with a particular focus on evaluating the feasibility of this process at both laboratory and pilot scales. This research addresses the growing need for sustainable energy solutions and tackles the environmental issue posed by the massive influx of sargassum in the Caribbean, where it has become a significant pollutant in the region. The methodology centers on enhancing the understanding of the interaction between sargassum and microwaves, with the goal of optimizing and intensifying the pyrolysis process. As part of this strategy, laboratory-scale studies were conducted, where the batch pyrolysis of sargassum solids was investigated, using silicon carbide (SiC) and, for the first time, sargassum biochar as microwave absorbers. The use of sargassum biochar proved more effective than silicon carbide (SiC), yielding a higher quality bio-oil, due to its lower acidity, and a higher production of biogas rich in hydrogen and carbon monoxide. At the pilot scale, a reactor was developed and evaluated for compatibility with the microwave system through thermographic analysis and simulations using COMSOL. A technically functional reactor was produced, though its microwave behavior was strongly influenced by the evolving permittivity of the Sargassum. The reactor’s efficiency in batch pyrolysis of sargassum solids was assessed, and while technical challenges remain, the process shown promise for treating large quantities of sargassum in semi-batch on the solid fraction and valorizing this invasive biomass.