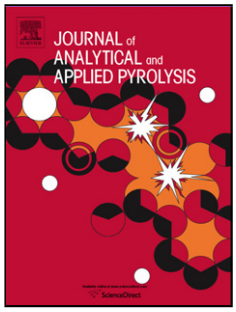

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Co-pyrolysis and co-hydrothermal liquefaction of seaweeds and rice husk: Comparative study towards enhanced biofuel production

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Highlights

- Co-pyrolysis and co-hydrothermal experiments of seaweed and rice husk were compared.
- The co-pyrolysis and co-hydrothermal mechanisms have been revealed in this work.
- Synergetic effects have been observed during these two thermochemical conversions.
- Synergetic effects could improve the quality of bio-oil.

Abstract: The production of bio-oil and bio-char by fast pyrolysis and hydrothermal liquefaction of *Enteromorpha clathrata*, rice husk and their mixtures have been compared. The results indicated that hydrothermal liquefaction produced higher yield of bio-oil and lower yield of bio-char for the same raw samples. There were more macromolecules (hexadecanoic acid, cyclopenten and esters), small-molecule hydrocarbons and N-containing compounds in hydrothermal liquefaction bio-oil, while more aromatic substances were observed in fast pyrolysis bio-oils. There was significant difference between *E. clathrata* bio-oils from these two thermochemical methods. C=O, $CH/CH_2/CH_3$ and N-H functional groups in *E. clathrata* bio-oil from hydrothermal liquefaction showed stronger absorption strength than bio-oil from fast pyrolysis. However, the only difference between rice husk bio-oil from hydrothermal liquefaction and fast pyrolysis was aromatic ring signal in Fourier transform infrared spectroscopy curves. In addition, synergistic effect was investigated during the co-pyrolysis and co-hydrothermal processes. Such synergistic effect led to the improvement recorded in the bio-oil quality by deoxidation reaction to increase the H/C ratio in bio-oil from co-pyrolysis of *E. clathrata*/rice husk blends, and reduces the O/C ratio in bio-oil from co-hydrothermal process, and also enhances the calorie value of bio-oil. The synergistic effect, however, lowered the co-pyrolysis and co-hydrothermal bio-oils yields. Moreover, the addition of rice husk into *E. clathrata* promoted