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Non-oxidative torrefaction of biomass to enhance its fuel properties

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1 NON-OXIDATIVE TORREFACTION OF BIOMASS TO ENHANCE ITS FUEL  
2 PROPERTIES

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10 ABSTRACT

11 Torrefaction upgrades the biomass as an energy source enhancing its poorest  
12 characteristics. Non-oxidative torrefaction of six biomass samples (pine,  
13 eucalyptus, chestnut, holm oak, olive tree pruning and vine shoot) was  
14 conducted in a tube furnace reactor within the range 200-300 °C and proximate,  
15 ultimate and heating value analysis as well as wettability studies were carried  
16 out to characterize the torrefied samples and find the optimal temperature of the  
17 process. In addition, Pyrolysis-gas chromatography/mass spectrometry (Py-  
18 GC/MS) was performed and chemical-kinetics parameters of torrefaction were  
19 obtained at optimal temperature. At optimal torrefaction temperature, moisture  
20 was reduced up to 2.5 % and H/C and O/C atomic ratios up to 1.3 and 0.6,  
21 respectively. Contact angle measurements show an increase in hydrophobic  
22 behaviour. Lignin was affected by torrefaction since decomposition products  
23 from guaiacyl (G) and syringyl (S) units were released during Py-GCMS  
24 experiments. The global reaction order was 2.2 and kinetic constant values

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