

BIOCHAR FRACTURE RESISTANCE

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Biochar is a brittle material that tends to break under mechanical stress. This could be an advantage if it is intended to obtain a char powder, but it is typically unwanted since it generates dust that induce biochar losses or even explosion risk. Mechanical stresses are typically observed inside pyrolysis reactors (Scala et al., 2006), during transport/storage and finally inside the soil (Spokas et al., 2014). There are few data in the literature regarding the mechanical strength of char (Capon et al., 1980). This study aims at assessing the impact of pyrolysis temperature and biomass species on fracture resistance. The type of pyrolysis (slow or fast) is also evaluated. Biochar were prepared from three types of woody biomass: oak, Douglas and poplar. The pyrolysis is achieved with a spoon reactor under nitrogen flow. The final temperature is controlled, whereas it is possible to achieve slow pyrolysis if the wood sample is placed inside the reactor before heating it or fast pyrolysis if the wood sample is introduced inside the reactor when it is hot.

Char yields are systematically determined. Fracture resistance was measured with an Instron compression test machine. The biochar samples were made cylindrical (diameter = 6 mm and height = 2 mm). The experimental results given on Figure 1 show different behavior between slow and fast pyrolysis. In any case, oak char was more resistant than poplar char.

These results will be detailed and discussed on the basis of SEM pictures. These new data indicate that the char mechanical resistance is a complex property that should be more carefully studied since it is important for application purposes.

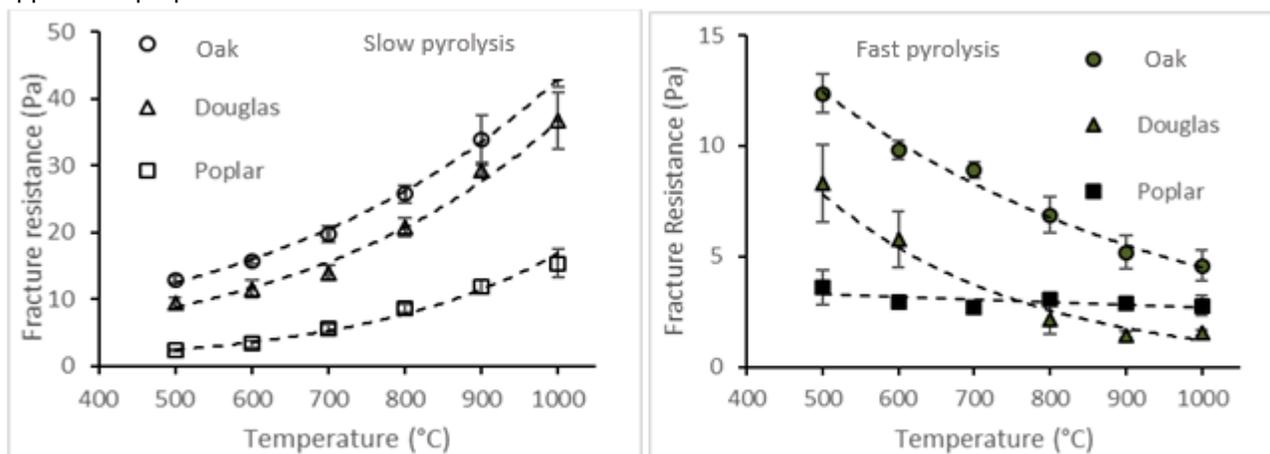


Figure 1 – Fracture resistance as a function of pyrolysis temperature

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