

## Effect of pyrolysis conditions and composition on the char structure and char yield of biomass chars - DTU Orbit (08/11/2017)

### Effect of pyrolysis conditions and composition on the char structure and char yield of biomass chars

The char yield as well as physical and chemical structure of chars generated from different types of biomass divided into five different particle size fractions from 50 $\mu$ m to 1mm were studied to better understand the influences of holding time, final temperatures and heating rates on the pyrolysis characteristics of biomass chars. An additional study of the char phase-organic transformation was conducted on the biomass organic matter.

Char samples were generated in a wire-mesh reactor up to 1400°C, and with the heating rates between 10 K/s and 3000 K/s. The results were compared with the data gained from slow (10 K/min) and fast heating (600 K/min) by thermogravimetric analysis (TGA). Scanning electron microscopy (SEM/EDS), elementary analysis and Fourier transform infrared spectroscopy (FTIR) were conducted to determine the effect of operating conditions and the biomass composition on the char structural changes.

A significantly different char yield was observed between heating rates 10 K/s and 1000 K/s. For heating rates > 600 K/s a similar biomass char yield was obtained. Overall, it was found that the final temperature has more influence on the char yield than the heating rate. The scanning electron microscopy indicated different types of softening and melting of the biomass chars at all applied temperatures, heating rates and holding times, except for rice husks, which formed chars with a structure similar to the parent fuel. The char particles generated at high pyrolysis temperatures had many small pores and showed complete melting, while the biomasses like wheat straw and beech wood showed larger pores and not complete melting with the remaining carbon skeleton of different forms. FTIR analysis was conducted to estimate the remaining organic composition of the char consisting mainly of hemicellulose and lignin.

### General information

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