Adsorption and decomposition of tar model compounds over the surface of gasification char and active carbon within the temperature range 250-800 °C - DTU Orbit (31/03/2019)

The carbonaceous products of gasification or pyrolysis (chars) and active carbon (AC) have been found effective as adsorbents for tar species and active as catalysts for tar conversion. However, a deeper understanding of the interaction between aromatic compounds and carbonaceous surfaces is needed for the practical implementation and optimization of carbon-based gas cleaning systems. The aim of this work is to investigate the performance of various wood-derived chars and AC within a wide temperature range (250–800°C). Residual char from gasification, pyrolysis char and two types of AC were tested for their capability to remove tar model compounds (toluene and naphthalene) from a gaseous flow. A dedicated setup was used for this purpose, while post-experimental characterization revealed the modifications occurring at the surface of chars. Adsorption was observed in the lower temperature range, whereas cracking reactions were found to initiate at 600°C and to become significant at 800°C. Results suggested that AC represents a better option for tar adsorption applications (e.g. carbon filters) operating at temperatures of 250°C and possibly below, whereas gasification residual char resulted as the most promising substrate for tar cracking at temperatures of 800°C and above.

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