Adsorption and decomposition of tar model compounds over the surface of gasification char and active carbon within the temperature range 250-800 °C

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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