The reaction behaviour of two different coals is analysed in a pressurised entrained flow reactor (PiTER) and a pressurised thermogravimetric analyser (PRETA). The entrained flow reactor is used to produce char samples under conditions relevant to larger scale entrained flow gasifiers, i.e. at temperatures up to 1600 degrees C and pressures up to 2.5 MPa. The conversion rate of these char samples is measured under defined conditions in the PRETA using CO2 and H2O atmospheres. Furthermore, the development of char surface area during devolatilisation and char gasification is analysed in the PiTER. The initial surface area after devolatilisation is dependent on pressure. In the later stages of conversion a significant loss of surface area is detected. The decrease in surface area is attributed to a melting of mineral matter as the PiTER is operated above the ash melting temperature of the coals. The development of the mass specific surface area during gasification cannot be described by the Random Pore Model probably because of the ash melting, but by an empirical correlation. The surface area data are combined with the thermogravimetric analysis to derive the intrinsic reaction rates at the char surface. The intrinsic rate is modelled by nth order and Langmuir-Hinshelwood rate equations. The temperature influence on the char-CO2 reaction can be described by an activation energy of...
200 kJ/mol, and on the char-H2O reaction by an activation energy of 212 kJ/mol. The activation energy is found to be independent of the char preparation conditions, whereas the pre-exponential factor significantly decreases for a higher heat treatment severity of the char sample. The model equations can be used to predict the intrinsic gasification behaviour in the absence of mass transport limitations.

Stichworte: Entrained flow gasification Kinetics Char conversion Specific surface area Intrinsic reactivity FLUID-SOLID REACTIONS BITUMINOUS COAL-CHAR RANDOM PORE MODEL ELEVATED PRESSURES CO2 GASIFICATION STEAM GASIFICATION HEATING RATE DEVOLATILIZATION PYROLYSIS BEHAVIOR

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