5－3 DIRECT OBSERVATION OF ASH FORMATION and QUANTIFICATION OF ASH SINTERING DURING COAL GASIFICATION

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Ash behavior in coal gasifier is strongly influenced by the property of gas, quantity of unreacted carbon, temperature of ash layer, particle composition, particle size, but quantified data are not enough. In this study, the CO_2 gasification process of coal char was observed directly using a captive particle imaging apparatus(CPIA). The thermogravimetry was also carried out. The densification degree and the crushing strength of pelletized ash obtained from heat-treated coal or char were investigated in CO_2 or 60%CO/CO_2 gas. We also attempted to observe ash sintering process using CPIA.

The gasification rate of SS005 char did not depend on the particle size. It was presumed that the gasification proceeded even inside of the char. The gasification state in the direct observation was confirmed to agree with the result of thermogravimetry. During the direct observation of SS005 char at 1300°C, there occurred no agglomeration and unification of particles, but some showed significant contraction and fusion. At 1200°C and 1300°C, the particles of White Oak coal (WO) char were gasified while contracting and unifying to each other, and plural particles generated ash. Both SS005 ash and WO ash began to sinter at around 900°C. There is a region where no densification proceeds and strength increases. Ash sintering behavior differs with the coal type and the gas atmosphere.

Direct observation of the CO_2 gasification process (from Table 7)

WO char (106-150 μm)