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CATALYTIC ASH FREE COAL GASIFICATION IN A FLUIDIZED BED THERMOGRAVIMETRIC ANALYZER

Said Samih and Jamal Chaouki¹

Abstract

Catalytic ash free coal gasification was investigated in the newly developed fluidized bed thermogravimetric analyzer. The total yield obtained from the fluidized bed TGA showed good agreement with the total gas product. For char gasification, the values of activation energy and pre-exponential factor were similar to those obtained from coal gasification in our previous work. The activation energy for the CO shift reaction decreased by 56% and 37% from the value reported in our previous work for coal gasification and in literature for catalytic coal gasification respectively. For the methane reforming reaction, the value of the activation energy was reduced by 33% from the one observed previously in our work, in the absence of a catalyst and decreased by 42% from the one reported in literature for catalytic gasification. The carbon conversion for the catalytic ash free coal gasification was 69% higher than the value obtained from the coal gasification for the same experimental conditions. This value was found to be 44.5% for the ash free coal gasification. The heating value of the gas product by using the catalyst for temperatures below 520°C was also higher than without catalyst. However, at higher temperature, using the catalyst had no effect on the heating value of the gas product.

Keywords:

Fluidized bed TGA; Coal; gasification; Ash free coal; catalytic gasification; Kinetics; Activation energy; Equilibrium; Pyrolysis; Tar

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