

### A Kinetic Evaluation of Catalytic Gasification of Lignite with Carbon Dioxide by Thermogravimetric Analysis

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The catalytic activity of  $K_2CO_3$ ,  $Na_2CO_3$ ,  $K_2SO_4$  and  $FeSO_4$  in the gasification of lignite with  $CO_2$  was studied by thermogravimetric analysis. The catalysts were added to the lignite sample by physical mixing at 5–15% wt loading. Gasification experiments were carried out at temperatures ranging from 600 °C to 900 °C using  $N_2$ - $CO_2$  reactant gas mixture at ambient pressure. The conversion vs. time data was analyzed with a gas–solids reaction model to evaluate kinetic parameters. At all temperatures and catalyst loadings,  $K_2CO_3$  showed greatest effect in the enhancement of gasification rate, which was found to range from 5–18 times that of the uncatalyzed reaction while  $FeSO_4$  showed relatively no effect in the enhancement of gasification. At 800°C, complete carbon conversion could be obtained within 10 min with the catalysts according to the following activity –  $K_2CO_3 > Na_2CO_3 > K_2SO_4$ . The activation energy for the gasification with individual catalyst are well within the range in the literatures.