

发电

几种金属催化褐煤焦水蒸气气化的实验研究

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摘要

在固定床反应器中研究了碱金属K、碱土金属Ca、过渡金属Ni和Fe对褐煤焦水蒸气气化的催化效果,测定了各种焦样的基碳转化率随时间的变化关系。实验结果表明, K和Ca金属使气化温度分别降低110℃和70℃; Ni和Fe对焦的水蒸气气化具有一定的催化作用,但其催化活性低于煤灰中所含金属的综合催化活性。褐煤原煤中内在的矿物质对其焦水蒸气气化具有催化作用。在化学反应控制区域内,添加K金属的焦样和脱灰煤焦水蒸气气化的气化速率在整个转化率范围内保持不变,气化反应级数为0。添加Fe的焦样和原煤焦样水蒸气气化动力学符合均相反应模型。对于添加Ca和Ni的焦样,其气化动力学可由缩核模型来描述。

关键词 [催化气化](#) [褐煤焦](#) [动力学特性](#) [金属催化剂](#)

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Experimental Study on Steam Gasification of Lignite Char Catalyzed by Several Metals

Abstract

Effects of alkali, alkaline earth and transition metals (K, Ca, Ni, Fe) on the steam gasification of a lignite char were investigated by a fixed-bed reactor, and the carbon conversions with time of different chars were examined. Experimental results show that K and Ca lower the gasification temperature by 110℃ and 70℃ respectively. Ni or Fe has some catalytic effect, but its activity is lower than that of the inherent minerals in the raw char. Steam gasification of the lignite char is catalyzed by the inherent minerals in raw lignite. Under a regime controlled by chemical reaction, the gasification rates of the chars loaded with K₂CO₃ and the demineralized char are constant with burn-off, indicating that the reactions are of zero order. The kinetics are well described by the homogeneous model for the raw chars and the chars loaded with Fe, and by the shrinking core model for the chars loaded with Ca and Ni.

Key words [catalytic gasification](#) [lignite char](#) [dynamical behavior](#) [metal catalyst](#)

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