催化、动力学与反应器

单颗粒煤焦燃烧反应动力学研究方法

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摘要

采用热天平研究了福建龙岩和加福的两种煤焦的单颗粒燃烧过程。探讨其燃烧过程中的气体扩散、灰层以及反应阻力的影响，建立了单颗粒煤焦燃烧过程分析方法，并由此建立了单颗粒煤焦热天平测定化学反应本征动力学常数的新方法。研究发现，随着单颗粒煤焦燃烧的进行，燃烧总阻力逐渐减小，当反应趋于结束时，燃烧阻力不再随反应时间变化，而是趋于稳定，此时燃烧阻力即为化学反应本征动力学的阻力，由此测定化学反应本征动力学常数。通过对不同温度、不同粒径煤焦以及不同空气流量下的实验与分析，表明该测定方法稳定性好，且测得的煤焦燃烧本征动力学常数和活化能与文献报道一致。

关键词

等温热重法　单颗粒　煤焦　本征反应速率常数

分类号

Methodological study on combustion reaction kinetics of single coal char particle

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Abstract

The combustion process of two kinds of single coal chars particle was studied by using the TGA method.The effect of mass transfer of gas, ash layer diffusion and inherent oxidation reaction resistances on the combustion process was investigated.An analysis method for single coal char particle combustion process and a new method determining inherent combustion reaction constant were established.It was found that the total resistance of combustion decreased with the combustion process.While the reaction approached the end, the total resistance of combustion reached a fixed value.At this point, combustion resistance was equal to inherent combustion reaction resistance, and thus the inherent kinetics constant was obtained.By experimental investigation under different air flow rates, temperatures or particle diameters, the consistency of this method was verified.The inherent combustion reaction constant and activation energy were measured with this method, and agreed well with the traditional method.

Key words

isothermal thermo-gravimetric analysis　single particle　coal char　inherent kinetics constant

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