

工程热物理

水焦炭燃烧动力学参数求解方法

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摘要: 利用热重分析仪获得水焦炭的燃烧失重特性曲线, 采用四种动力学模型求解了水焦炭的活化能, 分析了其动力学特性, 并与兖州烟煤水煤浆进行对比。结果表明, 同一反应深度(转化率a)水焦炭的活化能低于烟煤水煤浆; Coats-Redfern法可以得到燃烧过程的平均活化能, 得到水焦炭的反应级数为0.7, 烟煤水煤浆的反应级数为1.0; 等转化率的Flynn-Wall-Ozawa法和Friedman-Reich-Levi法可以得到活化能随转化率的变化趋势, 后者结果更可靠; 非Arrhenius公式的Dollimore法可以得到和Friedman-Reich-Levi法相近的活化能结果,这两种方法可以作为求解水焦炭燃烧动力学参数的优选方法。

关键词: 水焦炭 水煤浆 热重分析 动力学分析

Kinetic Parameters of Petroleum Coke Water Slurry Combustion by Different Methods

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Abstract: Thermoanalysis curves of combustion of a petroleum coke water slurry(PCWS) were recorded by a thermogravimetric apparatus. Kinetic parameters such as activatin energy of PCWS were evaluated by four different methods, and compared with that of a coal water slurry(CWS) prepared with bituminous coal from Yanzhou, Shandong. Results showed that the activation energy of PCWS was smaller than that of the bitumous CWS at certain conversion rates; using Coats-Refern method, an average activation energy of the whole combustion process can be achieved, and the reaction order, n, of PCWS and Yanzhou CWS was 0.7 and 1.0 respectively; the relationship between activation energy and conversion rates was plotted by Flynn-Wall-Ozawa method, also by Friedman-Reich-Levi method, and the results of the latter were more credible; activation energy obtained by Dollimore method, which was not originated from the Arrhenius formula, approximated to that by Friedman-Reich-Levi method.The last two methods are superior to others in evaluating kinetic parmeters of PCWS.

Keywords: petroleum coke water slurry coal water slurry thermogravimetric analysis dynamic analysis

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