

论文

添加剂对煤粉燃烧过程活化能变化规律的影响

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摘要:

采用热重法研究不同添加剂对煤粉燃烧性能的影响, 通过积分法计算加入添加剂煤样的燃烧反应活化能, 考察DTA曲线中燃烧放热峰的变化规律。结果表明, 向煤中加入2%的MnO₂, CaO和CeO₂, 燃烧放热温度由535 ℃降至480~490 ℃, 活化能由98 kJ/mol降至70~80 kJ/mol; 而加入等量的K₂CO₃, 燃烧放热温度降至460~470 ℃, 活化能降至50~60 kJ/mol。燃烧反应活化能E与燃烧放热峰对应温度T的变化趋势相一致, 两者遵循玻尔兹曼方程 $E=106.22-323.37/[1+\exp(T/35.45-11.42)]$ 。

关键词: 热重法; 差热分析; 添加剂; 煤; 活化能

Effects of additives on activity energy of raw coal during combustion in the air

Abstract:

The combustion kinetic characteristics of raw coal with different additives were studied using thermal gravimetric analysis. The integral method was used to calculate the individual activity energy of the samples, and the temperatures of peaks in the DTA curves were computed. The results show that adding 2% of MnO₂, CaO and CeO₂ to raw coal can reduce the temperature of the peak during combustion from 535 ℃ down to the range of 480-490 ℃, and lower the activity energy from 98 kJ/mol to the range of 70-80 kJ/mol; the addition of 2% of K₂CO₃ can lower the temperature to the range of 460-470 ℃ and activity energy to the range of 50-60 kJ/mol. The coincidences of the activity energy (E) and temperature (T) are found to conform to the Boltzmann equation described by the relationship of $E=106.22-323.37/[1+\exp(T/35.45-11.42)]$.

Keywords: thermogravimetry; differential thermal analysis; additive; coal; activity energy

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