

### 平朔煤和生物质共热解实验研究

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### Co-pyrolysis of Pingshuo coal and biomass

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**摘要** 利用热重分析技术对平朔煤、生物质及两者混合物的热解特性进行了研究,考察了生物质掺混比例对平朔煤热解的影响。结果表明,不同掺混比例下生物质与平朔煤共热解时,平朔煤的挥发分析出温度和最大热解速率对应的温度呈现出规律性变化。将混合样品热解时的实际失重速率曲线与按比例折算后的曲线进行对比,发现实际失重速率曲线与折算曲线有所偏差,并不是平朔煤与生物质热解失重速率的简单相加,说明混合热解过程中有协同作用。同时,利用Coats-Redfern法,对平朔煤、生物质及两者混合物的热解主要阶段用一级反应过程描述,计算其动力学参数,发现反应活化能 $E$ 和指前因子 $A$ 随着生物质掺混比例不同呈现出规律性变化,对其规律进行了机理分析,证明了掺混生物质对平朔煤热解起到了促进作用,认为平朔煤与生物质共热解过程存在协同效应。

**关键词:** 平朔煤 生物质 共热解 动力学 协同效应

**Abstract:** An experimental study on co-pyrolysis of biomass and Pingshuo coal was performed using temperature programmed thermogravimetric analysis under atmospheric pressure in high purity nitrogen (99.999%). Sawdust and rice straw were chosen as biomass feedstocks. The final pyrolysis temperature was designed as 1 273 K and the heating rate was 10 K/min, and the mixture ratios of the biomass were 20%, 50% and 70% respectively. The results indicate that the initial temperature of volatile emission from Pingshuo coal and the temperature corresponding to the maximum pyrolysis conversion during co-pyrolysis vary with the ratio of biomass. Moreover, in co-pyrolysis there is difference between the experimental and calculated DTG curves. In addition, the method of Coats-Redfern was used to calculate the activation energy and frequency factor of pyrolysis for the coal and biomass. The results show that the activation energy and frequency factor change with the mixing ratio of the biomass, and it can be deduced that there exist the synergetic effects between the biomass and Pingshuo coal during their co-pyrolysis process.

**Key words:** Pingshuo coal biomass co-pyrolysis kinetics synergetic effects

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