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能源和环境工程

煤粉密度对燃煤过程中颗粒物形成特性的影响 [

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摘要

通过浮选实验先将典型烟煤分成高、中、低3个密度段，然后对3种不同密度原煤在沉降炉内进行热解和燃烧实验，研究原煤密度对颗粒物形成机理和特性的影响。实验采用低压撞击器（LPI）把颗粒物按不同粒径大小从0.03～10.0 μm共分13级，分别采集燃烧后的可吸入颗粒物。实验结果显示：低密度原煤对颗粒物形成的贡献最大，中密度次之，高密度最小，低密度原煤所含矿物质粒度最小，形成的焦的膨胀率、总孔体积和BET表面积最大，高密度原煤所含矿物质粒度最大，形成的焦的膨胀率、总孔体积和BET表面积最小，中密度原煤介于两者之间，3种密度原煤燃烧后形成的PM10 颗粒物元素构成的相同点是：对于亚微米颗粒物，元素S＋碱金属元素＋其他元素>难熔元素，对于超微米颗粒物，难熔元素占80%以上，远远大于其他三类元素。

关键词 煤燃烧 颗粒物 浮选 焦 元素构成

分类号

Effect of density fractionation on formation characteristics of particulate matter during coal combustion

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Abstract

A Chinese bituminous coal was firstly separated into three density fractions, heavy (>2.0 g·cm-3), medium (1.4—2.0 g·cm-3) and light (<1 4 g·cm-3) by using the float sink method Next,the combustion and pyrolysis of each density fraction were carried out in a laboratory scale drop tube furnace to understand the emission, elemental composition and formation mechanism of inhalable particulate matter (PM10) PM10 was collected with a 13 stages low pressure impactor (LPI) having aerodynamic cut off diameter ranging from 10.0 μm to 0.03 μm for a size segregated collection The experimental results indicated that density affected PM10 emission significantly in combustion,and decreasing coal density led to the formation of more PM10 The mineral particle size of the light fraction was the smallest and that of the heavy fraction was the largest The swelling ratio, total pore volume and BET surface area of char produced from each fraction were different Those from the light fraction were the largest and those from the heavy fraction were the smallest.The elemental composition of PM10 collected from each density fraction had the same trend In the submicron particulate matter (PM 1): element S+alkali metals+others>refractory metals， in the supermicron particulate matter (PM 1—10): the mass percent of refractory metals were greater than 80% and exceeded other three types of element.

Key words

coal combustion particulate matter float-sink method char elemental composition

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