

工程热物理

O₂/CO₂气氛下痕量元素的赋存和迁移特性

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摘要: 在管式炉中进行徐州烟煤的燃烧实验。通过改变燃烧气氛, 用电感耦合质谱分析仪(inductively coupled plasma- mass spectrometry, ICP-MS)研究O₂/CO₂燃烧方式下O₂含量及温度对煤中As、Cr、Pb等痕量元素赋存、迁移特性的影响, 并在相同的氧浓度下研究CO₂浓度对痕量元素排放的影响。结果表明: 痕量元素及其化合物的熔点、沸点等物理性质对元素挥发影响很大; 较之常规燃烧方式, O₂含量的变化并没有改变As、Cr、Pb、Ni等痕量元素在底灰中的含量随温度升高而降低的总体规律; 随着燃烧气氛中O₂含量的升高, Cr、Ni在底灰中的含量有所降低, 而As、Pb在底灰中明显富集; 随着温度升高, 燃烧气氛对As在底灰中富集的影响逐渐减弱; 此外, 在相同的O₂含量下, CO₂含量越高, As在底灰中的含量越低, 因为高浓度的CO₂在一定程度上抑制了更易挥发的次氧化物或单质的生成。

关键词: O₂/CO₂燃烧 痕量元素 氧浓度 迁移特性

Trace Elements Occurrence and Migration Characteristics in O₂/CO₂ Atmosphere

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Abstract: By changing combustion atmosphere in a tube furnace and analyzing the bottom ash of Xuzhou bituminous coal with inductively coupled plasma-mass spectrometry (ICP-MS), the migration behavior of trace elements at different temperature and different combustion atmosphere (different oxygen content in atmosphere) were researched. The effect of CO₂ concentration on the migration of trace elements was also researched. The results show that the melting point, boiling point and other physical properties of trace elements and their compounds have great impact on trace elements volatilization process. Compared with conventional combustion mode, oxygen content does not change the rule that concentrations of As, Cr, Pb, Ni in ash decrease as the temperature rises. With the increasing of oxygen content, amount of Cr, Ni in bottom ash decreases, while content of As, Pb in the ash increases. With temperature increasing, content of trace elements in different oxygen concentration atmosphere become smaller, which indicates that the effect of oxygen content on the migration of trace elements weakens. At the same oxygen content, the more CO₂ content, the more As content in the ash, because high CO₂ concentration inhibits the formation of simple substance or sub-oxides which are more volatile and lead to little As content in the ash.

Keywords: O₂/CO₂ combustion trace elements oxygen content migration characteristics

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