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发电

燃煤飞灰中磁珠的化学组成及其演化机理研究

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摘要
采用X射线衍射仪（XRD）和场发射扫描电镜结合X射线能谱分析仪（FSEM-EDX）对燃煤电厂飞灰中磁珠的矿物相特征及化学组成进行了系统的研究。结果表明：磁珠中含铁矿物主要有赤铁矿、磁铁矿、磁赤铁矿和镁铁矿。根据磁珠中铁含量的不同将其分成4类：铁氧化物相(w(Fe)≥ 75%)、含铝硅的铁氧化物相(75%＞w(Fe)≥50 %)、富铁的铝硅酸盐相(50 %＞w(Fe)≥25 %)和含铁的铝硅酸盐相(w (Fe)＜25%)。铁氧化物相是由含铁矿物直接氧化而成；内在含铁矿物与粘土矿物以不同比例熔合分别形成含硅铝的铁氧化物相、富铁的铝硅酸盐相和含铁的铝硅酸盐相；外在含铁矿物与内在粘土矿物的熔合也可形成含铝硅的铁氧化物相。含铁量较高的铁氧化物相和含铝硅的铁氧化物相易形成灰沉积初始层，是产生结渣的根本原因；低温下熔融的富铁铝硅酸盐相易粘附于初始沉积层上，是结渣加剧的主要原因。

关键词 热能动力工程 磁珠 化学组成 演化机理 飞灰 煤燃烧

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Chemical Composition and Evolution Mechanism of Ferrospheres in Fly Ash from Coal Combustion

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Abstract
Minerals and chemical composition of fly ash and ferrospheres from pulverized coal-fired power plants have been analyzed using X-ray diffraction (XRD) and field scanning electron microscopy with energy dispersive X-ray analysis (FSEM-EDX). The result shows that the ferrospheres are mainly composed of hematite and magnetite, with a small amount of maghemite and magnesioferrite. According to the contents of iron, the ferrospheres in fly ash are devided into four groups, namely ferro-oxides(Fe≥75%), aluminosilicate- bearing ferro-oxides(75%＞Fe≥50%), high-ferriferous aluminosilicates (50%＞Fe≥25%), and ferro-aluminosilicates (Fe<25%). By studying the microstructures and chemical compositions of the ferrospheres, it has been possible to propound a mechanism for their formation. Ferro-oxides are derived from oxidation of excluded iron-bearing minerals or included iron-bearing minerals which are not mixed with aluminosilicates; aluminosilicate-bearing iron-oxides, high-ferriferous aluminosilicates and ferro-aluminosilicates are formed by the fusion of different proportion of included iron-bearing minerals and clays minerals. Ferro-oxides and aluminosilicate-bearing iron-oxides are important sources of the initial layer which occurs in deposits formed in coal burning systems. Preferential deposition of liquid iron sulphides followed by in situ oxidation is believed to be the mechanism by which these deposits form. The deposition of molten pyrrhotite together with silicates resulted in an iron silicate deposit with a very low melting point, accounting for the molten character of the slag. Such detailed studies provide additional insight into the mechanisms which govern ash deposit.

Key words thermal power engineering Ferrospheres characteristic of reduction Evolution mechanism unburned carbon content in fly ash analyzing model of coal grade

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