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伊敏褐煤中微量元素的地球化学特征及其无机-有机亲和性分析

梁虎珍, 曾凡桂, 相建华, 李美芬

太原理工大学煤科学与技术教育部及山西省重点实验室 地球科学与工程系, 山西 太原 030024

Geochemical characteristics and inorganic-organic affinity of the trace elements in Yimin lignite

LIANG Hu-zhen, ZENG Fan-gui, XIANG Jian-hua, LI Mei-fen

Key Laboratory of Coal Science & Technology, Ministry of Education & Shanxi Province, Department of Earth Science & Engineering, Taiyuan University of Technology, Taiyuan 030024, China

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摘要 采用脱矿物质、提取腐殖酸等方法结合ICP-MS对伊敏15上、16下煤中的32种微量元素的含量及其赋存特征进行了分析。与地壳克拉克值及中国侏罗-白垩纪煤和世界褐煤中微量元素含量相比,伊敏褐煤中微量元素没有明显富集。脱矿物质处理后,Ni明显富集,As略比原煤高,其他微量元素都低于原煤。原煤提取腐殖酸和脱矿物煤提取腐殖酸中Ni、Mo、Cd、Sn、W明显富集,这表明Ni、Mo、Cd、Sn、W和腐殖酸形成了稳定的有机态化合物。原煤提取腐殖酸残煤和脱矿物煤提取腐殖酸残煤中V、Ni、As富集,表明V、Ni、As与煤的大分子结构形成了稳定的有机态化合物。根据微量元素和灰分的相关性系数,把微量元素分为以下几类:无机富集元素Cr、U;亲无机元素Cu、Cd、In、Sn、Ga、Y、Zr、Hf、Bi、Th;偏无机元素Be、Sc、Rb、Sr、Nb、Cs、Ta、Pb;偏有机元素V、As、Tl、Ba、Se;亲有机元素Li、Co、W;有机富集元素Ni、Zn、Mo、Sb。

关键词: 煤　腐殖酸　煤大分子结构　微量元素　无机-有机亲和性

Abstract: The occurrence characteristic and contents of 32 trace elements in 15# and 16# coals in Yimin were analyzed using ICP-MS combined with demineralization and extraction of humic acid. Compared with Clark values and contents of trace element in Jurassic-Cretaceous coal in China and lignite in the world, there were no obvious enrichment of the trace elements in Yimin raw coal. Contents of most trace elements, expect Ni and As, in demineralized coals are lower than those in the raw coal. Some trace elements, Ni, Mo, Cd, Sn, and W significantly enriched in humic acid extracted from raw coal and demineralized coal, which indicates that these elements form the stable organic-compounds with humic acid. Meanwhile V, Ni and As were found to be enriched in raw coal and demineralized coal,which showed that the stable organic-compounds could be formed between V, Ni,As and coal macromolecule. 6 kinds of trace elements in Yimin coal are classified based on correlation coefficient between ash and trace element: inorganic enriched elements-Cr and U; inorganic affinity element-Cu, Cd, In, Sn, Ga, Y, Zr, Hf, Bi and Th; the tendency of inorganic affinity element-Be, Sc, Rb, Sr, Nb, Cs, Ta and Pb; the tendency of organic affinity element-V, Cr, Co, Cu, Se, Y, Mo, Cd, Sn, Sb, Ta and Tl; the organic affinity element-Li, Co and W; the organic enriched elements-Ni, Zn, Mo and Sb.

Key words: coal　humic acid　macromolecular　trace element　inorganic-organic affinity

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通讯作者: 曾凡桂,Tel:0351-6010468,E-mail:zengfangui@tyut.edu.cn。　E-mail: zengfangui@tyut.edu.cn

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