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先锋褐煤及其热溶残煤的过氧化氢氧解

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H_2O_2 oxidation of Xianfeng lignite and its thermal extraction residue

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摘要 利用1-甲基萘（1-MN）对先锋褐煤进行热溶，并在温和条件下分别对原煤及其热溶残煤进行过氧化氢氧化。结合元素分析和FT-IR对各级产物进行结构表征，用GC/MS对氧化反应水溶性产物的甲酯化衍生物进行分析。结果表明，先锋褐煤在1-MN中的热溶率较低，320 ℃下热溶残煤（TR）的收率为81.01%，该煤主要以共价键交联的大分子结构为主，非共价键缔合的小分子含量较低，并以脂肪结构为主，含一定量的羰基以及少量的羟基和芳香结构。原煤和热溶残煤氧化水溶性产物中α，ω-二羧基烷酸含量较高，同时还发现，相当含量的芳香酸及三元羧酸存在，其中，α，ω-二羧基烷酸主要以丙二酸和丁二酸为主；原煤中可溶小分子易被氧化并生成较复杂的产物。与原煤相比，热溶残煤结构更为规整，氧化主要以共价键交联的大分子结构的氧化解聚为主，氧解率较低，水溶性氧解产物也较简单，种类较少，据此推测先锋褐煤的桥键主要以为-CH_2-和-CH_2-CH_2-为主。

关键词： 褐煤　热溶　过氧化氢氧解　GC/MS

Abstract: Thermal extraction of Xianfeng lignite (XL) with 1-methylnaphthalene (1-MN) was carried out at 320 ℃, and the H_2O_2 oxidation of the thermal extraction residue (TR) was compared with that of XL raw coal. The thermal extract (TE), TR and the oxidized residues were characterized by element analysis and FT-IR. The aqueous products from oxidation reaction were esterified and analyzed by GC/MS. The result shows that the yield of TR from XL in 1-MN is 81.01%. It indicates that XL is mainly composed of macromolecular structure cross-linked by covalent bond, with less low molecular compounds associated by non-covalent bond interactions. The TE is mainly composed of aliphatic hydrocarbons, carboxylic acid esters with less aromatic structures and hydroxyl group. GC/MS results suggest that the water-soluble products contained highest content of α, ω-dicarboxylic acids, especially malonic acid and succinic acid, with much amount of benzoic acid and tricarboxylic acids. The low molecular weight compounds associated in the macromolecular structure of raw coal can be easily oxidized under the conditions and more species of oxidation products are obtained. Compared with the structure of raw coal, the structure of TR is more regular. The oxidation of TR mainly occurs on the macromolecular structure cross-linked by covalent bond, resulting in the higher yield of oxidized residue and less species of water-soluble products from TR. The high yields of malonic acid and succinic acid in the water-soluble products suggest that -CH_2-and -CH_2-CH_2-are the main cross-linking bonds in the macromolecular network structure of XL.

Key words: lignite　thermal extraction　oxidation　GC/MS

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