

Occurrence and origin of minerals in a chamosite-bearing coal of Late Permian age, Zhaotong, Yunnan, China

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ABSTRACT

The minerals found in the no. 5 coal (Late Permian) from the Zhaotong Coalfield, Yunnan Province, southwestern China, have been examined and found to consist mainly of kaolinite, pyrite, chamosite, quartz, and calcite, with trace amounts of illite and mixed-layer illite-smectite. The proportion of chamosite in clay minerals ranges from 32 to 56 wt%, with an average of 46 wt%. Chamosite is distributed not only in collodetrinite, but also occurs as cell fillings in fusinite, semifusinite, and telinite. The high content and mode of occurrence of chamosite in this mine indicate its formation by interaction of kaolinite with Fe-Mg-rich fluids during early diagenesis. Except for a minor amount of terrigenous quartz, most quartz is of authigenic origin and formed from kaolinite desilication. The calcite content of the no. 5 coal is 1.4–6.3% (with an average of 3%) and is distributed in collodetrinite and as cell fillings of coal-forming plants. Calcite originated from seawater invasion during peat accumulation. Pyrite occurs in several ways: as massive, framboidal, isolated enehedral/anhedral, and euhedral forms. In addition, the presence of a large amount of pyritized red algae provides strong evidence of seawater invasion during peat accumulation. The red algae may have played an important role in the enrichment of sulfur in the coal. The characteristic assemblage of minerals in this mine resulted from a unique basinal environment in which the mineral matter was derived from a basaltic source region, volcanic activity, and seawater transgression during coal formation.

Keywords: Coal, minerals in coal, chamosite, Zhaotong Coalfield, Late Permian, China