A preliminary study of mineralogy and geochemistry of four coal samples from northern Iran

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Abstract

This study is related to four Jurassic-age bituminous coal (0.69–1.02 Ro%) samples collected from coal mines from the west, central and east of central, Alborz in northern Iran. Geological settings played key roles in determining the geochemistry and mineralogy of coals from the central Alborz region of northern Iran. The mineralogy of coals from the eastern part of the region is dominated by kaolinite; halloysite; and carbonates such as calcite, dolomite/ankerite, and siderite. The coals were deposited in a lacustrine environment. In the western part of the region, where the depositional setting was also lacustrine with volcanic input and tonstein deposition (glass shards present), the coal primarily contains kaolinite (68%) and fluorapatite (26%). In contrast, coal from the central part of the region, which was deposited in a terrestrial environment and on eroded limestone and dolomite rocks, is dominated by dolomite (98%) with little input by kaolinite. These coals have low sulphur (0.35–0.70 wt.%), which is mostly in the organic form (0.34–0.69 wt.%). Pyritic sulphur is detected only in one coal and in small quantities. The boron contents of these coals range from 9 to 33 mg/kg, indicating that deposition occurred in a fresh water environment. Coal with higher concentrations of Ba, Sr, and P contain fluorapatite and goyazite–gorceixite series [BaAl3 (PO4)2 (OH)5, H2O] minerals, which indicates volcaniclastic input. Compared to world coal averages, these coals exhibit low concentrations of elements of environmental concern, such as As (1.3–5.9 mg/kg), Cd (<0.02–0.06 mg/kg), Hg (<0.01–0.07 mg/kg) Mo (<0.6–1.7 mg/kg), Pb (4.8–13 mg/kg), Th (0.5–21 mg/kg), Se (<0.2–0.8 mg/kg) and U (0.2–4.6 mg/kg). Two of the northern Iranian coals have concentrations of Cl (2560 and 3010 mg/kg) that are higher than world coal average.

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1. Introduction

There is little known about the geochemistry and mineralogy of Iranian coals except a brief reference to the petrology of a coal sample from Zerab by Teichmüller (1982) and a study carried out by Stasiuk et al. (2003) on the petrology, rank and liquid petro-