Journal of Economic Geology
Vol. 7, No. 2 (2015-2016)
ISSN 2008-7306

مجله زمین‌شناسی اقتصادی
جلد ۷، شماره ۲ (سال ۱۳۹۴)
صفحات ۱۹ و ۲۰

Mineralogy and geochemistry of the Jurassic coals from the Gheshlagh mine, Eastern Alborz

Gholam Hossein Shamanian*and Fatemeh Hosseini Ashlaghi

Geology Department, Faculty of Sciences, Golestan University, Gorgan, Iran

Submitted: Dec. 24, 2013
Accepted: Dec. 15, 2014

Keywords: *Coal, Mineralogy, Geochemistry, Trace elements, Eastern Alborz, Gheshlagh*

Introduction

The Alborz structural zone in northern Iran is the host of a number of important coal deposits. The Gheshlagh coal mine is one of them, which is located 35 km southeast of Azadshahr. Coal bearing strata in the Gheshlagh mining district occur in the middle part of the Lower Jurassic Shemshak Formation which consists mainly of shales, siltstones and sandstones. The Geshlagh coals have a low sulfur content and a low ash yield. The ash content of coal and its geochemical character depends on the environment of deposition and subsequent geological history (Yazdi and Esmaeilnia, 2004). The purpose of this study was to investigate the texural and mineralogical characteristcs of the Ghashlagh coals and to identify the geochemistry of the major and trace elements and their relationship to specific mineralogical components. These results are necessary to improve the understanding of coal characterization and to relate the mineralogy of different materials to their potential for producing acidic or alkaline mine waters associated with mining and preparation processes.

Materials and methods

About 20 samples were collected from the main coal seams. These samples were taken from fresh faces of the mine to avoid weathered surfaces and get fresh samples. The petrography of the samples was carried out by the conventional microscopic methods at the Golestan University. Mineralogical analyses were done by a X-ray diffractometer equipped with a CuKα tube and monochrometer (XRD Philips PW 1800) at the Kansaran Binaloud Company. The coal samples were initially crushed to less than 200 μm and homogenized. Then, 50 g from each sample was heated to 525 ^{o}C according to the United States Geological Survey procedure (Bullock et al., 2002). The concentration of the major and trace elements in the resulting ash samples was determined using a wavelength X-ray fluorescence spectrometer (XRF Philips PW 1480) at the Kansaran Binaloud Company.

Results

The Coal-bearing formation in the Ghashlagh mine belongs to the clastic unit of the Shemshak Formation, consisting mainly of about 2400 m sandstone, siltstone, shale. The middle part of this formation includes the economic coal beds.

Petrographic and mineralogical investigations indicate that the dominant mineral phases of the Gheshlagh coals are quartz, kaolinite, montmorillonite, albite, muscovite, illite and pyrite. Pyrite occurs as euhedral to anhedral crystals and locally as framboids which are disseminated in the coal. Oxidation products consist mainly of iron hydrosulfate resulting from the oxidation of pyrite.

The organic/inorganic affinity of elements in coal was determined using the correlation coefficient between the elements and ash yeild. Si, Al, Ti, Fe, K, Na, Ga, Zr, Rb and Nb are mainly associated with minerals. Sr, Pb and Ni have a dual association. The concentrations of most trace elements in the Gheshlagh coal samples are high when compared with the usual reported range in the world. The contents of Pb and Ni show the highest concentrations.

Discussion

The Gheshlagh coals are characterized by relatively low amount of sulfur indicating deposition in lacustrine and swamp environments (Goodarzi et al., 2006). The concentration of Ni, V, Sr, Ba and Ce in the Gheshlagh coals are

*Corresponding authors Email: gh.shamanian@gu.ac.ir

relatively higher than the Shahroud and Lushan coals (Yazdi and Esmaeilnia, 2004). The comparison of the concentration of trace elements in the Gheshlagh coals and worldwide concentrations (Swaine, 1990) indicates the enrichment of Ni and Pb in the Gheshlagh coals. Gluskoter et al. (1977) used a value of six times the Clarke value to determine if an element is enriched in the whole coal. By these criteria, the concentration of Ni and Pb are enriched in the Gheshlagh coals when compared with the Clarke values.

Generally, the distribution and abundance of reacting mineral species in the coal mines can be used to predict the extent of acidification and neutralization in particular area. In the Gheshlagh coal mine, the frequency of pyrite is moderately low. In addition, the availability of carbonates in the host rocks provides buffering capacity for acid produced by oxidation in this area. This investigation has led to a better understanding of coals and their roof and floor lithologies in the Gheshlagh coal mine.

Acknowledgment

The authors wish to thank the Iran Minerals Production and Supply Company (Project No. 30716) and the Department of Geology, Faculty of Sciences at the Golestan University for financial assistance and all necessary resources needed to carry out this research.

References

Bullock J.H., Cathcard J.D., and Betteron W.J., 2002. Analytical methods utilized by the United States Geological Survey for the analysis of coal and coal-combustion products, United States Geological Survey, Denver, Report 389, 15 pp.

Gluskoter H.J., Ruch R.R., Miller W.C., Cahill R.A., Dreher G.B., and Kuhn J.K., 1977. Trace elements in coal: occurrence and distribution, Illinois State Geological Survey, Illinois, Report 499, 115 pp.

Goodarzi F., Sanei H., Stasiuk L.D., Bagheri-Sadeghi H., and Reyes J., 2006. A preliminary study of mineralogy and geochemistry of four coal samples from northern Iran. International Journal of Coal Geology, 65 (1-2) 35-50.

Swaine D. J., 1990. Trace Elements in Coal, Butterworths, London, 278 pp.

Yazdi M., and Esmaeilnia A.S., 2004. Geochemical properties of Coal in the Lushan Coalfield of Iran, International Journal of Coal Geology, 60 (1) 73-79.