Mineralogical and Elemental Variations in the Genesee Mine, Alberta, Canada

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The Genesee mine is located 70 km west of Edmonton, AB near Stony Plain, AB. The coals mined are the Paleocene Ardley coal zone which occur in the upper Scollard Fm, the youngest member of the Edmonton Group (Smith, 1989). The Ardley coal zone is the most extensive coal of the Alberta Plains and has six seams developed at the Genesee location. These seams consist of the Cloud, No.1, No.2 Rider, No.2, No.2A and No.3 seams with the No.2 and No.3 being the most economic. The Genesee mine is one of three mines in the area that mine the Ardley coal zone for use as thermal coals. As a result, the mineralogy and trace elements concentrations are of interest. The mineral matter is important for utilization and for determining the environment of deposition. Trace elements are of interest for utilization and environmental concerns.

The major mineralogy of the Genesee mine coals and associated sediments has been determined on LTA by XRD/XRF and the accessory mineralogy by SEM/EDX on pellets of unashed samples. The elemental concentrations were determined by INAA, AA and ICP. The major mineralogy consists of quartz, feldspar, illite and kaolinite with variable amounts of calcite, siderite and mixed layer clays. Accessory minerals include sphalerite, barite, chlorite, biotite, monazite, titanium oxides, ilmenite, zircon, muscovite, dolomite and a complex Fe-Cr-Ni oxide, possibly trevorite-chromite. The mineralogy of the Genesee mine is more diverse than that of the other two mines (Whitewood and Highvale), despite their close proximity. For example, the major mineralogy of the Whitewood mine consists of quartz, kaolinite and mixed layer clays (Gentzis et al., 1996).

In general, the elemental concentrations are lower than world coals (Swaine, 1990). There are high concentrations of As, Hg, Cr (up to 2620 ppm versus an average concentration of approximately 30 ppm), Co, Cu, Mn, Mo, Ni and V in some samples. Investigation of lateral trends in the No.3 seam indicate that there is very little variations for most elements, however, Cr, Co, Cu, Mn, Mo, Ni and V tend to have sharp increases in concentration in some samples. The increases of all these elements, except Hg, occur where the trevorite-chromite are more abundant.

Trace element and mineralogical variations reflect changes in the depositional environment. The varied mineralogy and changes in elemental concentrations reflect a stronger fluvial influence on the Genesee mine in comparison to the other two mines. In addition, abrupt changes in the mineralogy of the No.2 and No.3 seams reflect changes in the geochemical environment of these seams. For instance, the base of the No.3 seam consists of quartz, feldspar and illite. The upper section of the seam consists of quartz, calcite and siderite.

References
