

The natural attenuation of metals in coal fields, Pınarhisar, Thrace Basin, Turkey

CEMILE ERARSLAN¹, YUKSEL ORGUN¹, NURGUL BALCI¹

¹Istanbul Technical University erarslan@itu.edu.tr

¹Istanbul Technical University orgun@itu.edu.tr

¹Istanbul Technical University ncelik@itu.edu.tr

Thrace Basin, which has approximately 2 billion tons coal reserves and polymetallic ore deposits, is one of the important basin of the Turkey. The Pınarhisar coal fields, having a high sulfur (0.3-5.95%) and metal content, is located northern part of the Thrace Basin. This study focused on the natural attenuation of metals in Pınarhisar coal fields. For this purpose coals, surface and groundwaters in addition to underclays and overclays taken from the Pınarhisar coal fields were analysed for their metal contents (Cr, Mn, Co, Ni, Cu, Zn, As, Cd, Pb, Th, U etc.). The physicochemical parameters of surface and groundwater (pH, Eh, EC, salinity, dissolved oxygen and alkalinity) were measured in-situ during both dry and wet seasons. Metal contents of the coals (Cr, Mn, Co, Ni, Cu, Zn, As, Cd, Pb, Th, U.) are higher than the world clark values. In contrast surface waters within the coal field have low metal contents (Cr (up to 1.5 ppb), Mn (up to 70 ppb), Co (up to 0.24 ppb), Ni (up to 1.7 ppb), Cu (up to 6 ppb), Zn (up to 4.7 ppb), As (up to 34.6 ppb), Pb (<0.1 ppb), Th (<0.05 ppb) and U (up to 19.8 ppb)). Consistently groundwater has also low metal content (Cr, up to 2.6 ppb, Mn, up to 486 ppb, Co, up to 2.77 ppb, Ni, up to 1.9 ppb, Cu, up to 6.4 ppb, Zn, up to 198 ppb, As, up to 4.8 ppb, Pb, up to 0.8 ppb, Th <0.05 ppb, U, up to 13.5 ppb). The lower metal concentrations of surface and groundwaters in the region may be due to clay interclated with coal. The clays, consist of vermiculite, illite, kaolinite, calcite and albite minerals, are enriched in Cr (up to 286ppm), Mn (up to 539 ppm), Co (up to 42 ppm), Ni (up to 267 ppm), Cu (up to 54.7 ppm), Zn (up to 101 ppm), As (up to 18.5 ppm), Pb (up to 20 ppm), Th (up to 12.2 ppm) and U (up to 29 ppm) compared to the coals, surface and groundwaters suggesting a natural metal attenuation processes in the field which will be discussed in detail.