

Element Enrichment and Organic Matter-Element Relationship of the Eskişehir Oil Shale Deposit, NW Turkey

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Early-Middle Miocene aged Eskişehir oil shales deposited in lacustrine environment occurs in alteration with claystone, siltstone, conglomerate and lignite. The thickness of oil shale varies between 20-30 m.

In this study, major and trace element contents of Eskişehir oil shales and the relationship between total organic carbon (TOC) and different elements have been investigated. In addition, Enrichment factor (EF) calculations were carried out to examine element enrichment with respect to average shale. According to mean enrichment factor values, Eskişehir oil shales have extremely high S and B enrichment, very high As and Ni enrichment, significant Ag, Au, Bi, Ca, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Na, P, Sn, Sr, and U enrichment, moderate Mg, Pb, Sb, Zn, Th, and V enrichment and deficiency to minimal Ba enrichment. Element concentration ranges in oil shales are: 0.06-4.63 % for S, 21-1164 mg/kg for B, 1.6-581.4 mg/kg for As, 26.3-329.6 mg/kg for Ni.

The analytical results were evaluated to understand chemical variability using several multivariate statistical methods such as correlation and cluster analysis. Spearman correlation analysis were examined at significance levels of $p \leq 0.05$ and $p \leq 0.01$. TOC value is strongly correlated with Sr, Ca, B and S. Based on single-linkage and Pearson's correlation coefficients, hierarchical cluster analysis was applied to the oil shale samples. Result of cluster analysis indicate that the elements comprise two main groups. The first group is composed of Mo, Cr, V, B, TOC, Sr, Ca, S, and Ag. Cluster and correlation analysis indicate that total organic carbon (TOC) is closely associated with S, Sr, B, Mo, Cr, Ca, Ag, and V elements.