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Environmental Characterization of Israeli Coal Ash

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Abstract

In order to maximize the utilization of coal ash produced in Israel, it was important to supply detailed and reliable information on the ash chemical properties, particularly these ones that may affect the environment. As the Israel Electric Corporation monitors the environmental quality of coal ash for nearly twenty years, its quality is now well established. Bituminous coals are burnt in Israeli power stations, so the ash chemical composition fits that of class F fly ash according to the ASTM system (pozzolanic fly ash). With regard to major elements, fly ash contains mainly oxides of silica, aluminium and iron, which together form more than 90% of the ash weight. For part of the coal sources, the calcium content can be also significant. From the mineralogic aspect, fly ash is constituted mainly of amorphous aluminosilicates (glass) and is characterized by an alkaline pH. The aluminosilicate matrix is practically insoluble in water, and the environmental effects of coal ash result mainly from its pH and the presence of the trace elements adsorbed on the surface of the ash particles.

According to the operations permits of the power stations "Orot Rabin" and "Rutenberg", the Israel Electric Corporation conducts a follow-up of the concentrations of sixteen trace elements and three radionuclides in representative samples of coal, fly ash and bottom ash, collected every six months. According to guidelines issued by the Ministry of Environmental Protection in 1998, this quality monitoring includes also the analysis of the fly ash samples by the leaching test of the USEPA, called Toxicity Characteristic Leaching Procedure – TCLP. The results of the quality monitoring show that the trace elements concentrations in coal ash are low, and fit the concentration ranges characteristic for unpolluted soils (except boron). In view of the TCLP results for the period 7/98 - 6/09, for all trace elements, the fly ash produced during this period is conform to the criteria defining the ash as "utilizable". The environmental specifications imposed on the import of new sources of coal ensure that the ash environmental quality will not be impaired in the future.

The high ash quality established on the basis of laboratory analyses is firmly confirmed by the results of environmental monitoring conducted in the proximity of coal ash in the field. According to the groundwater monitoring results, those obtained near the ash storage sites inside the power stations (for example at the "Rutenberg" power station) as well as those obtained near sites where ash was utilized for road construction (for example near the road to Jassar A'Zarka), no evidence was found of any impact of the coal ash on groundwater quality.