Trace elements in the neighbourhood of a coal-fired power station

M.A. Gouveia
M.C. Freitas
M.I. Prudêncio

Departamento de Química, ICEN-INETI, Estrada Nacional 10, 2685 Sacavém, Portugal.

Introduction

The combustion of coal is one of the most important sources of particulate emission (Bertine & Goldberg, 1971). Besides, the composition, treatment and fate of effluents is also of interest for environmental protection.

The environmental control using the instrumental neutron activation analysis (for inorganic constituents determination) in the neighbourhood of the Sines coal-fired power station (Electricity of Portugal, Alentejo, Portugal) has been undertaken for about three years (Freitas, 1993; Prudêncio *et al*, 1994). In this work, chemical results obtained for coal and respective ashes obtained by combustion, are presented together with the results obtained for effluents of the coal and the ashes deposits, and groundwaters. Aerosols and soils collected at the north and south of the station (100m distance) were also analysed.

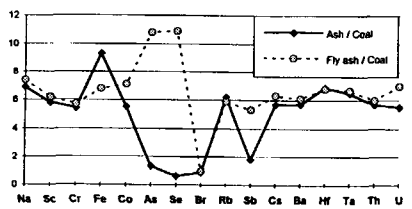

FIG. 1. Variations in trace elements concentration due to coal firing: ashes/coal and fly ash/coal.

Experimental

Samples of coal, ash, fly ash, effluents and groundwater were collected in the Sines coal fired power station, located near Sines (Alentejo). Soils (0–10cm depth) and aerosols were collected near the station, in the north and the south (predominant winds from N,NW). The chemical analyses were made by instrumental neutron activation analysis (INAA) using the relative method (Gouveia *et al*, 1992) and the k_o-method (Freitas & Martinho, 1989). The samples were irradiated in the RPI ('Reactor Português de Investigação') with a neutron flux of 3.2×10^{12} n cm^{-2} s^{-1}.

Results and discussion

Variations due to coal combustion (ashes/coal and fly ashes/coal) are shown in Fig. 1. Among the elements determined, iron is the only more concentrated in the ashes than in the fly ashes. For the other elements, As and Se are the more concentrated in the finer particles.

As far as the relative concentration of the elements in the effluents is concerned (Fig.2), Na, Co, As, Br and Sb appear to be the more

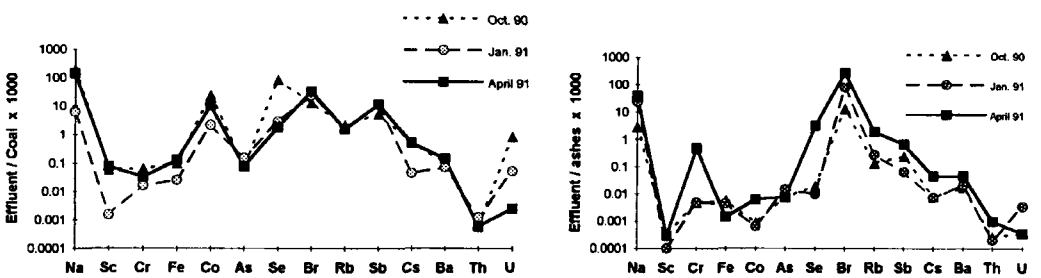

FIG. 2. Effluent/coal and effluent/ashes ratios.

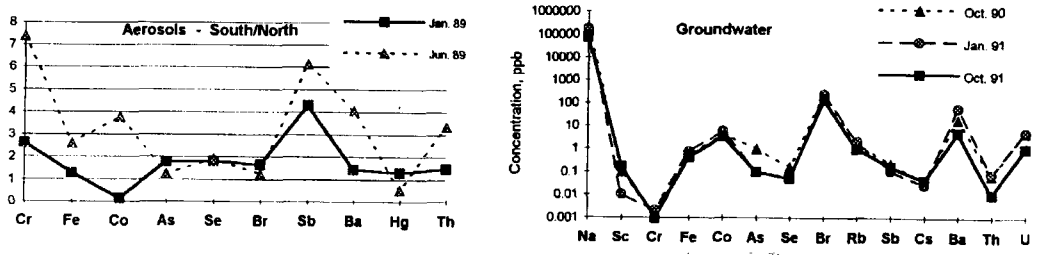

FIG. 3. Chemical results obtained for aerosols and groundwaters.

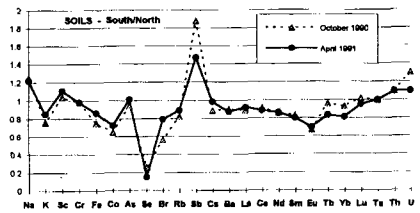

FIG. 4. Element concentrations in the soils from the south compared with the soils of the north of the station.

mobilized elements from the coal, while Na and specially Br are the most mobilized from the ashes.

For winter and summer of 1989 sampling of aerosols, Sb is the more enriched element in the south relative to the north (Fig. 3). Groundwater composition reflects the effluents composition, with significant amounts of Na, Co and Br (Fig.3). The soil samples collected in the north and south of the station does not appear to be influenced by the station, except for Sb, as it was found in the aerosols collected nearby (Fig.4). However, it should be noted that the sampling loci are too close of the station. Soils collected at different distances of the station are now being analysed.

References

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