

# Analysis of Coal Ash for Trace Elements and their Geo-environmental Implications

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**Abstract** This study determined the content of trace elements in coal ash collected from a coal-fired thermal power plant using local coal from Sawarak, Malaysia. This is crucial for the potential impact on the geoenvironment from its disposal and utilization; as coal ash has recently been produced locally in substantial amounts and very limited data is available. The trace elements concentrations presents in coal ashes are compared with the reported coal ash concentrations and the risk for the local wet tropical geoenvironment from the perspective of its vulnerability to these is studied for an indication of potential environmental implications on the wet tropics. The trace elements were found to be in concentrations that, if applied or inadvertently released into the environmental media, present a potential hazard and further necessary research in this regard is indicated.

**Keywords** Trace elements · Coal ash · Wet tropics · Geoenvironmental implications

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## 1 Introduction

Coal combustion generates an enormous coal residue containing previously sequestered trace elements. Coal utilization in thermal power plants for electrical power generation has increased significantly and accumulating coal ash poses disposal challenges and a threat to the geoenvironment (Adriano 1986). Apart from being a continuing disposal problem their uses in soil treatment, as conditioners or filler material for low lying waste lands, in refuse dumps reclamation and construction or geotechnical secondary raw materials (Cabrera and Woolley 1994; Eymael and Cornelissen 1996; Barnes 2001; Adriano et al. 2002; Giere et al. 2003) increases their potential geoenvironmental impact. Trace elements in coal and coal ash have been discussed extensively (Adriano 1986; Eary et al. 1990; Mattigold et al. 1990; Swaine 1990; Finkelman 1994) and their presence is an environmental concern (Hansen et al. 2002, Reijnders 2005). The trace elements in coal ash need to be determined and assessed for potential effects (Giere et al. 2003). As, Cr, Pb, V, Zn in coal ashes present a significant environmental burden (Reijnders 2005). The bioavailability and toxicity of trace elements (Depledge et al. 1998) is, however, dependent upon its speciation.

The trace elements poses a higher threat in the wet tropics as they can retard or are fatal for microbial activity in turn affecting nutrients supply to vegetation (Doelman 1984). Arthur et al. (1984) reported significant reductions in microbial respiration upon fly ash