

Environmental concern elements in coal and coal combustion residues

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Abstract: Feed coals of studied thermal power plants contain several environmental concern elements (Cu, Cd, Cr, Pb). Enrichment in concentration of these elements in fly and bottom ash is take place during combustion. Combustion residues containing these elements are a potential source for ecological disrupt. Controlled emission technology and discarding process of ashes in power plants are vital from environmental aspect. Appropriate and secure recycling of ashes is a good alternative of its disposal for financial moreover environmental benefit.

Key Words: Coal; Coal combustion residues; Environmental concern elements

I. Introduction

Energy is the key for industrial and domestic progress of a country. Both conventional and renewable energy is essential for the fulfilment of energy demand (Tang et al., 2013). Still present coal has significant share (40%) in power generation in the world. India has reliable coal reserve (~118 billion tons) and 75% of country's power supply is shared from different thermal power plants. This fossil fuel contains several environmental concern elements (Hg, As, Cd, Cu, Cr, Sb, Pb, Ni etc) which may cause

environmental pollution and contamination due to combustion. The coal combustion residues (CCR) are anthropogenic source of various elements which is a great concern of ecological hazardous.

Assessment of environmental concern elements in coal and coal combustion residues collected from thermal power plants of West Bengal, India are carried out in this study to understand the restriction of combustion and its generated ashes on environment. Finally, proper disposal practice and reuse of this solid waste is discussed for sustainable environment.

II. Material and method

A representative samples of coal and coal combustion residues (fly and bottom ash) were collected from Farakka super thermal power station (Capacity 2100 MW) and Sagardighi thermal power station (Capacity 1600 MW). Microwave acid digestion of coal, fly and bottom ash (0.1gm of each sample) was done by acid mixture (HNO₃: HF: HCL= 3:1:1) and the solution were analysed by inductively coupled plasma mass spectrometry for the assessment of trace elements in the samples.

III. Result and discussion

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The average concentration of analysed trace elements (Cu, Cd, Cr, Pb) in coal, fly and bottom ash are represented in the Table 1. The concentrations of all the elements have higher concentration in both fly ash and bottom ash than the parent coal. The result reflects an enrichment of these elements due to combustion (Bhangare et al., 2011). The significant amount of these environmental concern elements in combustion residues is an apprehension because a lump sum amount of ashes is produced due to huge combustion. The emission and deposition during combustion as well as leaching of these elements from the stock ashes may contaminate air, soil and water of the neighbouring thermal power plants (Tang et al., 2013). The prolonged contamination may cause bioaccumulation and entering into the food chain which will be threat to the live stock. A clean technology for combustion and suitable disposal of combustion residues are needed to resist the emission as well as leaching of the environmental concern elements into the environment. Safe and eco-friendly utilisation of combustion residues is a good alternative than disposal from environmental along with economic sight (Bhangare et al., 2011; Tang et al., 2013). The CCR are generally recycled in construction material, ceramic industry and also in agricultural field. A chemical treatment and monitoring are urgently needed to limit negative impact of the environmental concern elements in CCR.

Elements	Coal	Fly Ash	Bottom Ash
Cu	30.56	63.42	44.75
Cd	1.55	2.84	1.92
Cr	24.64	38.35	32.55
Pb	22.85	39.15	31.75

Table 1. Average Concentration ($\mu\text{g/g}$) of environmental concern elements in coal and coal combustion residues

IV. Conclusion

Skilled emission control device in combustion process and suitable disposal practice of combustion residues are immediately essential to achieve the balance between energy generation and clean environment. Vast productions as well as improper dumping of this solid waste are a big concern for environmental contamination and pollution level aspects. Safe and quantum utilisation of coal ashes is a good remedy of harmful blow of coal combustion.

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Reference

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