



Review

Arsenic hazards in coal fly ash and its fate in Indian scenario

Vimal Chandra Pandey^{a,*}, Jay Shankar Singh^a, Rana P. Singh^a, Nandita Singh^b, M. Yunus^a^a Department of Environmental Science, Babasaheb Bhimrao Ambedkar (Central) University, Raibareilly Road, Lucknow 226025, Uttar Pradesh, India^b Eco-Auditing Group, National Botanical Research Institute, Council of Scientific and Industrial Research, Rana Pratap Marg, Lucknow 226001, Uttar Pradesh, India

ARTICLE INFO

Article history:

Received 1 June 2010

Received in revised form 4 April 2011

Accepted 8 April 2011

Keywords:

Arsenic hazards

Coal

Environmental problems

Fly ash pollution

ABSTRACT

Fly ash (FA) generated as a waste produced from thermal power plants globally has started gaining as a potentially significant anthropogenic source of arsenic (As). In India electricity generation is predominantly dependent upon coal-based thermal power plants and are being producing huge amount of FA. Coal contains many toxic metals, arsenic is one of those, which is significantly toxic for aquatic and terrestrial life including human being. Coal used in Indian thermal power plants is mainly bituminous and sub-bituminous and which on combustion generate over 40% of FA. Generated FA is being disposed to open ash pond in thin slurry form. More than 65,000 acre of land in India is occupied for storage of this massively generated quantity of FA. Dumping of FA in open ash pond causes serious adverse environmental impacts owing to its elevated trace element contents, in particular the As which causes ecological problems. Although, the As problem in our country is not new, in recent years the occurrence of As contamination cases of agricultural soil, ground water as well as human health has resulted a great concern for its mitigation. Very recently India has been charged for being a “dumping hub for As”. Utilization of FA in India is still infancy (more than 38%) as compared to developed countries (more than 70%). In India FA is used particularly in cement production, brick industry, as road base, as amendments in the restoration ecology and forestry. This review emphasized on the concentration of As in FA, its fate and behaviour as hazardous element on human health, environment quality and on mitigation strategies to accomplish environmental management.

© 2011 Elsevier B.V. All rights reserved.

Contents

1. Introduction	820
2. Indian coal	820
2.1. Arsenic forms in coal	821
2.2. Arsenic existing forms during coal combustion	821
3. Fly ash	822
3.1. Arsenic status in fly ash	823
3.2. Residence mode of arsenic in fly ash	824
3.3. Fate of arsenic in fly ash	824
3.4. Arsenic-leaching from fly ash	825
4. Arsenic poisoning of biosphere due to fly ash disposal	827
4.1. Atmosphere and arsenic-poisoning	827
4.2. Agricultural soil and arsenic-poisoning	828
4.3. Water and arsenic-poisoning	828
5. Analytical points	829
6. History and chemistry of arsenic	829
7. Sources of arsenic contamination	829
8. Arsenic toxicity due to fly ash	830
9. Arsenic in rice agriculture	830

* Corresponding author. Tel.: +91 522 2995605; fax: +91 522 2441888; mobile: +91 9454287575.

E-mail address: vimalcpandey@gmail.com (V.C. Pandey).