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GEOCHEMICAL AND MINERALOGICAL CHARACTERIZATION OF COAL COMBUSTION WASTES OF ANGREN THERMAL POWER STATION FOR ASSESSING THEIR FUTURE ECOLOGICAL THREATS AND INDUSTRIAL BENEFITS.

Shakhnoza RAKHMONKULOVA (1); Nosir SHUKUROV (1), Britta PLANER-FRIEDRICH (2)

(1) Institute of Geology and Geophysics, Academy of Sciences of Uzbekistan, Email: rshakhnoza@yahoo.com;
(2) University Bayreuth, Department of Environmental Geochemistry, Germany.

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INTRADUCTION

The problem of safe waste management currently has a global and intractable nature. The generation of electricity by thermal conversion of coal results in significant volumes of solid wastes. Most of these materials are disposed of in surface impoundments near coal-fired power plants. The Angren thermal power station in Uzbekistan was founded in 1958 and is working based on the nearby Angren lignite mine. The coal ash wastes (about 11 million tons since 1958) occupy an area of about 82 hectares. This study determines their geochemical and mineralogical characteristics and content of rare and trace elements. The data obtained show high concentrations of trace elements in the coal ash wastes. Elevated concentrations of As, Cd and other metals pose a potential ecological threat.

In a result of research in soils and plants found that the content of the ore minerals and wastes in the form of spheres, and various globular segregations increases when approaching the sources of pollution. The study of thin sections by microprobe, made from heavy fractions, provided an opportunity to submit the form in which heavy metals found in emissions. Heavy oils Angren soil consists mainly of different balls, consisting of iron oxides, in the same grains of hematite, and titan- magnetite. The internal structure and elemental composition of the most spheric is almost the same. Above they are covered with glandular shell, but inside they are composed of many small balls and mineral particles (figure 1). All this makes it possible to determine the predominant role of waste of Angren TPP in the origin of geochemical anomalies and the high dispersion halos of heavy metals in the area.

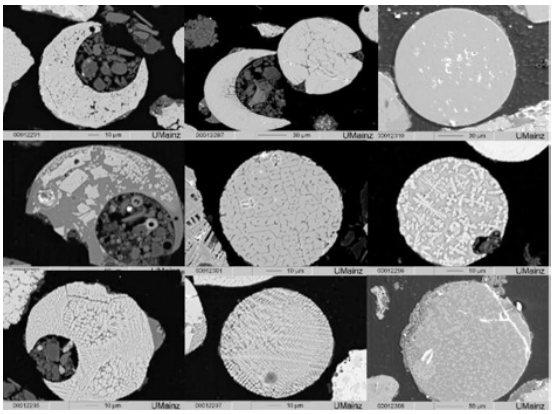

Figure 1 The morphology and structure of spheres in the heavy fractions of soil samples.

The properties of fly ash vary from one sample to the next depending on the source of the coal; degree of coal preparation, cleaning and pulverization: design, type and operation of the power plant boiler unit; conditions during combustion; additives used to assist combustion or improve precipitation performance; efficiency of emission control devices; storage and handling of the by products; and the prevailing climate.

Concentration of trace elements in the fly ashes is quite high (Table 1). In fly ash, zinc and lead displays the highest concentrations while cobalt the lowest.

Concentration of the some elements in fly ash of Angren TPP.

Element	values [ppm]
As	*93*
Cu	*108*
Cr	*65*
Cd	*11*
Co	*8*
Y	*28*
Mo	*57*
W	*82,3*
Ni	*14,2*
Pb	*307*
Sc	*11*
V	*62*
Zn	*1141*
Nb	*20,3*

Internationally, approximately 45% of the produced bottom ashes are used and applied in many sectors, as a secondary source of high quantities of valuable metals. By applying mineral processing technologies and hydro-metallurgical and biohydrometallurgical processes, it is possible to recover metals such as Al, Ga, Ge, Ca, Cd, Fe, Hg, Mg, Na, Ni, Pb, Ra, Th, V, Zn, etc., from bottom ashes. Recovery of metals from such wastes and their use are important not only for saving metal resources, but also for protecting the environment.

MATERIALS AND METHODS

Sampling program: The coal, fly ash, bottom ash and soil samples for this study were provided by the laboratory Environmental geochemistry and geotechnology of Institute of Geology and geophysics, Academy of science of Uzbekistan. The samples originated from Angren Thermal Power Plant (TPP). More than 100 fly ash and bottom samples with 3 triplicates from each site were provided for a total of three ash wastes. The samples were collected vertical and horizontal direction. The soil samples were collected from surface and below 20 cm from different locations around of coal combustion wastes. The pooled samples of fly ash and slag wastes, soils have been ventilated and sifted through a sieve of 2 mm and packed in plastic bags. The collected samples were dried at room temperature.

Methods: Chemical speciation, flotation, gravity, magnetic and electromagnetic separation techniques as well as XRF, XRD, SEM. Last analyses of major and trace elements concentration were determined in the fly ash, bottom ash and soil samples by ICP MS in Environmental Geochemistry University of Bayreuth 2011-2012. A six sequential extraction procedure was also applied.

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