METAL RICH AIRBORNE PARTICULATE MATTERS IN SURFACE SOILS OF ANGREN-ALMALYK MINING-INDUSTRIAL AREA, UZBEKISTAN

NOSIR SHUKUROV*

Institute of Geology & Geophysics, Academy of Sciences of Uzbekistan, Tashkent, 100041, Uzbekistan
nosirsh@gmail.com

Distribution and morphology of atmospheric particles on soil surface along the deposition gradient in Angren-Almalyk mining industrial area was main focus of this study. Soil samples were collected along two downwind transects at 22 sampling locations (in 2-km intervals) from the soil surface. The fine grained fraction (0,63mm) was subjected to gravity separation and fractioned into (i) a heavy and (ii) a light minerals. The heavy mineral fractions were embedded in epoxy-resin based briquettes. Element mappings were performed with the polished and carbon-coated thin sections using JEOL microprobe. A lot of grains and spherical particles with bright contrast appeared in the microprobe scans indicating heavy metal-rich chemistry. Spherical particles dominated in soil samples collected near the metal smelting and coal firing sites. Angular sulphide ore minerals (pyrite, galena, chalcopyrite, and sphalerite) were dominant in samples collected near the mining wastes depositories. The morphology and internal microstructure of spherical particles in heavy mineral fraction of soil samples from the Almalyk indicates a pre-existing molten phase, probably emitted by an inefficient air pollution control technique of the smelter. In subsamples of this transect spherical particles can divided in: pure metal particles (Cu, Zn, Al), metal-rich cores with silicate rims, small spherical metal sulphide or oxide particles within larger heterogeneous glassy particles, well organized particles with dendrite structure. Elemental composition of spherical particles in soils from Angren is very poor (almost all of them has elevated content of Fe oxide with less Si, Al, Mn, Ca). In some particles less contents of Pb, Cu and S were observed. Spherical particles in Angren soils can be divided into 3 groups: a) well organized massive dendrite particles with Fe oxide in light growing crystals and matrix containing Si, Al, Ca, Fe; b) homogenous spherical particles without any structures; c) small microscopic particles coated Fe oxide. Ore mineral particles are mainly hematite, titan-magnetite, magnetite and very less pyrite particles. Many of them covered with secondary ore minerals as Fe hydroxide and carbonates. Calcareous condition of soils in studied areas can stabilize atmospheric particles and prolong their weathering process by covering them with carbonate material. Obtained data can give a new insight into solubility and bioavailability of heavy metals in polluted soils.

Keywords: airborne metal-rich particles, heavy metals in soil surface,e nvironmental impact assessment