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EDITORIAL NOTE

Assessment of elemental composition and properties of copper smelter-affected dust and its nano- and micron size fractions

Mikhail S. Ermolin[1,2] · Petr S. Fedotov[1,2] · Alexandr I. Ivaneev[1] · Vasily K. Karandashev[1,3] · Andrey A. Burmistrov[2] · Yury G. Tatsy[2]

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Abstract

A comprehensive approach has been developed to the assessment of composition and properties of atmospherically deposited dust in the area affected by a copper smelter. The approach is based on the analysis of initial dust samples, dynamic leaching of water soluble fractions in a rotating coiled column (RCC) followed by the determination of recovered elements and characterization of size, morphology and elemental composition of nano-, submicron, and micron par ticles of dust separated using field-flow fractionation in a RCC. Three separated size fractions of dust (<0.2, 0.2–2, and >2 μm) were characterized by static light scattering and scanning electron microscopy, whereupon the fractions were analyzed by ICP-AES and ICP-MS (after digestion). It has been evaluated that toxic elements, which are characteristics for copper smelter emissions (As, Cu, Zn), are accumulated in fraction >2 μm. At the same time, up to 2.4, 3.1, 8.2, 6.7 g/kg of As, Cu, Zn, Pb, correspondently, were found in nanoparticles (<0.2 μm). It has been also shown that some trace elements (Sn, Sb, Ag, Bi, and Tl) are accumulated in fraction <0.2, and their content in this fraction may be one order of magnitude higher than that in the fraction >2 μm, or the bulk sample. It may be assumed that Sn, Sb, Ag, Bi, Tl compounds are adsorbed onto the finest dust particles as compared to As, Cu, Zn compounds, which are directly emitted from the copper smelter as microparticles.

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✉ Mikhail S. Ermolin
ermolin@geokhi.ru; mihail.ermolin@gmail.com

[1] National University of Science and Technology "MISiS", 4 Leninsky Prospect, Moscow 119991, Russia

[2] Vernadsky Institute of Geochemistry and Analytical Chemistry, Russian Academy of Sciences, 19 Kosygin Street, Moscow 119991, Russia

[3] The Institute of Microelectronics Technology and High-Purity Materials, Russian Academy of Sciences, 6 Institution Street, Chernogolovka 142432, Russia