**Separation and quantitative analysis of street dust using sedimentation field-flow fractionation in rotating coiled columns**

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Street dust contains toxic organic and inorganic pollutants and requires a special control. Toxic elements in street dusts may originate from various sources in urbanized areas, including industrial pollution, traffic emissions, atmospheric deposition, and natural geochemical processes. The size of dust particles is important factor like the chemical composition of street dust. Fine particles are most dangerous to human health due to their increased mobility and penetration ability. Particles >2µm can be separated by repeated sedimentation and decanting. Smaller particles may be fractionated and characterized by field-flow fractionation (FFF), however, the weight of the particulate sample to be handled is usually less than 1 mg.

A non-conventional sedimentation FFF employing a planetary centrifuge equipped with a rotating coiled column has been successfully applied to the separation of 100-200 mg of dust sample into nano-, submicron, and micron size fractions [1]. The fractions were weighted, characterized by static light scattering and electronic microscopy, and quantitatively analyzed by ICP-AES and ICP-MS (after digestion). The samples of dust were collected in two areas: in a big city (Moscow, Russia) and in a small town (Karabash, Russia) where a copper-smelting plant is located.

In the street dust samples from Moscow, the elements that may be of anthropogenic origin (Zn, Cr, Ni, Cu, Cd, Sn, Pb) were found to concentrate mainly in <0.3 and 0.3-1 μm fractions. The concentrations of Cr, Ni, Zn in the finest fraction (<0.3 μm) can be one order of magnitude higher than the concentrations of elements in bulk sample and coarse fractions. For rare earth elements (La, Ce, Pr, Nd, Sm) that are evidently of natural source and may be found in soil minerals, in contrary, higher concentrations were observed in large particles (10-100 μm).

An uneven distribution of toxic elements between the fractions of street dust samples from Karabash has been also observed. However, in this case the concentrations of heavy metals (Cu, Zn, Pb, Cr, Ni) and arsenic slightly increase with increasing the particle size. The concentrations of these elements in the fraction of particles >2 μm are 3-5 times higher than in the fraction of particles < 0.2 μm. It should be noted that the dust samples from Karabash are characterized by very high total contents of heavy metals and arsenic (11, 12, 6 and 4 g/kg for Cu, Zn, Pb, and As, respectively). It is also found that the significant part of these elements is present in the dust in a water-soluble form (16,1% Zn, 2.3% Cu, 2.1% As, and 0.5% Pb) and can be easily mobilized by rain.

The proposed approach can be a powerful tool for the risk assessment related to toxic elements in dust, ash, and other particulate environmental samples.

*The authors would like to acknowledge financial support from the Ministry of Education and Science of the Russian Federation* ***(****Program of Increasing Competitiveness of NUST «MISiS», project No К1-2014-026) and the Russian Foundation of Basic Research.*

*References*

[1] Fedotov P.S., Ermolin M.S., Karandashev V.K., Ladonin D.V. Characterization of size, morphology and elemental composition of nano-, submicron, and micron particles of street dust separated using field-flow fractionation in a rotating coiled column. *Talanta*. 2014. V.130. P. 1-7.