

PRESENCE OF TECHNOGENIC MAGNETIC PARTICLES IN FOREST TOPSOIL IN THE VICINITY OF INDUSTRIAL AND URBAN AREAS

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The presence of magnetic particles in topsoil can be easily detected using the simple measurement of magnetic susceptibility. On the base of “in situ” measurement some forest areas highly influenced by industrial and urban dust deposition connected with different kind of pollution sources (power plant, metallurgy, coke industry) were found and sampled. Such areas were located in Poland, Czech Rep. and Germany. The magnetic phase was separated from the O_f/O_h horizon of bulk topsoil sample. The morphology of technogenic magnetic particles as well as their mineralogical and chemical composition were analysed. The research was conducted with the use of energy dispersive spectroscopy (EDS), scanning electron microscope (SEM), X-ray diffractometer and Mössbauer spectroscopy, microprobe as well as magnetic techniques based on magnetic susceptibility and thermomagnetic curves. Most of the anthropogenic particles deposited in topsoil as a result of coal burning have spherical shape and diameter from <1 up to $800\text{ }\mu\text{m}$. Some of them have a smooth surface and the other have wrinkled surface. Many of them are sintered together with silicate phase (mullite, glassy phase). Their inner structure is twofold. The finer spherules have a full inside consist of ferromagnetic iron minerals, which are mostly non-stoichiometric and substituted spinels of magnetite – maghaemite serie. Close to metallurgical sources of emission also irregular particles of αFe and magnesioferrites were observed. In case of areas influenced by coke industry iron sulphurs both with pyrite and phyrrotite composition were found. The microprobe analyse for trace elements shown that many heavy metals as Pb, Zn, Cu, and Ni are connected with the magnetic particles. Some irregular “pumice-like” magnetic particles were also observed in samples taken close to metallurgical plants. In contrast to fly ashes where mostly intermediate magnetite – maghemite phases are observed the magnetic parameters of magnetic concentrates from topsoil suggest the presence only the magnetite as a major ferromagnetic mineral. It suggests the transformation of instable maghemite domains to magnetite. In case of magnetic separates from soils collected close to the metallurgical plants the Curie point was much over 700°C , what confirm the presence αFe .

forest topsoil, magnetic particles, soil magnetometry

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