

Studies of polluted environmental samples by Mössbauer spectroscopy and magnetic methods

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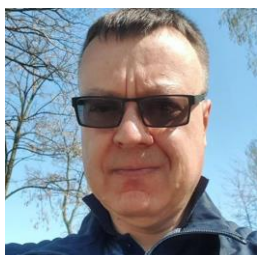
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Abstract

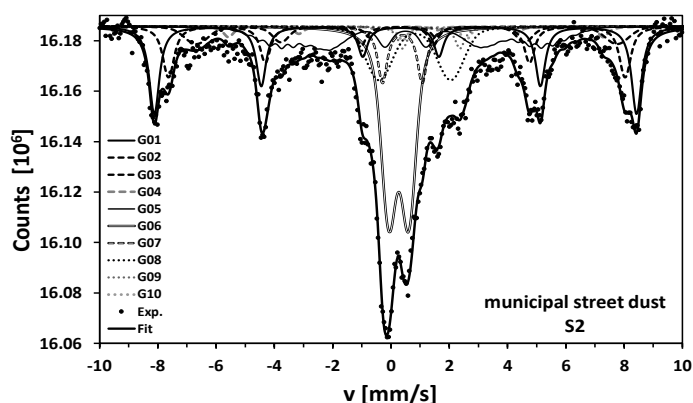
The urban and industrial dusts emitted from a different sources (like combustion and metallurgy) to the atmosphere and finally deposited into the soil contain magnetic fraction usually called as technogenic magnetic particles (TMPs). They abound the iron minerals, mainly oxides. Sensitive and quick methods for rough characterization of the samples containing TMPs are various magnetometric techniques. When the content of iron is high enough, the detailed mineral phase analysis is possible by means of transmission Mössbauer spectrometry [1-3]. The first series of the investigated samples were street dusts from different locations in Radom city (central Poland). The exemplary Mössbauer spectrum is presented in the figure. The elevated contribution of metallic iron and carbides is observed as wear products in vehicles braking systems. Dominating contribution of paramagnetic iron Fe^{3+} and Fe^{2+} originates mostly from aluminosilicates – the natural constituents of soils. The results obtained with Mössbauer spectrometry have been backed up by chemical fractionation analysis and magnetic susceptibility measurements. The second group of studied samples are forest topsoils and arable layers near various sources of TMPs in Poland and Norway. Main attention has been focused on the identification of specific forms and sizes of TMPs. In particular, the question of hematite content, stoichiometry of magnetite as well as contribution of titanomagnetite and iron sulphides has been analyzed. Besides the Mössbauer spectrometry the supplementary magnetic studies have been performed, like thermomagnetic analysis and magnetic hysteresis measurements.

Biography



Author has his expertise in the applications of Mössbauer spectrometry in environmental sciences. His great passion is joining this technique with advanced magnetic methods. His focus is based on the iron speciation in technogenic magnetic particles, which are natural carriers for heavy metals in soils, airborne particulate matter, fly ashes, street dusts and geothermal water sediments. He was awarded his PhD in 2002 from the Institute of Physics of Polish Academy of Sciences in Warsaw, Poland. In 2011 he got a tenure of associate professor at University of Technology and Humanities in Radom, Poland. He participated in scientific internships in Finland, France, Great Britain and Slovakia. Besides environmental studies he is an expert in magnetoelastic effects, magnetic nanomaterials, magnetic defectoscopy and modern mass metrology (in Central Office of Measures in Warsaw, Poland). He published more than 55 papers cited by more than 200 documents. His H-index is 9 on Scopus.

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Using so called Day plot [4,5] the saturation magnetization, remanence, coercivity and remanence coercivity have been presented for better identification of iron bearing TMPs fractions.

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