Standard materials of Fe and Mn oxides, hydroxides and carbonates in the study of technogenic magnetic particles

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Technogenic magnetic particles (TMP) are a component of industial dusts arose during high temperature technological processes. They are emitted to the atmosphere and then deposited on the soil, plant and building surfaces. Previous studies revealed that TMP are characterized by an affinity for other soil components (e.g. heavy metals).

The main objective of the research was identification of iron and manganese forms (mainly oxides and hydroxides) occurring in TMP. For the purpose of the study standards of Fe and Mn oxides, hydroxides and carbonates (natural Fe and Mn minerals, as much as specpure) were applied. Standard samples were subjected to magnetic (magnetic susceptibility measurements, temperature dependence of magnetic susceptibility) and mineralogical (scanning electron microscopy, electron microprobe X-ray analysis and powder X-ray diffraction) analyses.

Following Fe and Mn oxides, hydroxides and carbonates were investigated: magnetite, goethite, hematite, pyrolusite, rhodochrosite, groutite, jacobsite and hausmannite. Preliminary results indicated distinction between magnetic and mineral properties of the iron and manganese standards. While thermomagnetic curves of magnetite, hematite and goethite confirmed literature data, very promising and interesting results were found for Mn-containing minerals. Temperature curve of pyrolusite has a gentle course with decreasing magnetic susceptibility up to 640 °C, then rapidly increases and keeps rising during cooling to the room temperature. Whereas, in case of rhodochrosite magnetic susceptibility also decrease during heating and increase during cooling. However, around 350-400 °C increase is very large with peak in maximal value of susceptibility. Afterwards, the cooling curve has gentle dropping course.

Currently, analyses concerning identification of Fe and Mn forms in TMP are under way.

The research project received funding from the National Science Center of Poland on the basis of the decision number DEC-2013/09/B/ST10/02227.