Publications of the Institute of Geophysics, Polish Academy of Sciences
Geophysical Data Bases, Processing and Instrumentation
vol. 423 (C-112), 2018, pp. 5-6
DOI: 10.25171/InstGeoph_PAS_Publs-2018-004
16th Castle Meeting New Trends on Paleo, Rock and Environmental Magnetism, Chęciny, Poland, 2018

Using Thermomagnetic Curves as Indirect Indicator of Residual Pollution on Fluvial Sediments Affected by Mining Activities

Hermenegildo BARCEINAS-CRUZ[1,✉], Beatriz ORTEGA-GUERRERO[2], and Francisco M. ROMERO[2]

[1]Posgrado en Ciencias de la Tierra, Universidad Nacional Autónoma de México, Mexico

[2]Instituto de Geología, Universidad Nacional Autónoma de México, Mexico

✉ gildo@comunidad.unam.mx

A b s t r a c t

This work aims to evaluate the use of thermomagnetic curves to identify the presence of iron oxyhydroxysulfates (jarosite type minerals) by their transformation at high temperatures to ferrimagnetic iron oxides. Samples consist of fluvial sediments from a creek that was affected by a leak of sulfuric acid solution coming from a mine leachates dam, in Cananea, Sonora, Mexico. Measurements of volume magnetic susceptibility (κ) vs temperatures were performed in air, heating samples from 30 to 700 °C, and cooling back to 50 °C. Samples of the acid solution dam precipitates exhibited an important increase of magnetic susceptibility during heating, starting at 330 °C, and reaching its maximum (4 times the initial κ values) at 430 °C, followed by a drastic decrease; an even bigger increase of magnetic susceptibility during cooling was also observed. A very similar behavior was observed in samples of fluvial sediments from the affected basin, showing increases from 3 to 6 times the initial κ value during heating. Samples of not affected materials from the same area exhibited a contrasting behavior, presenting a decrease of κ during heating at 550 °C, and lower susceptibility values during cooling. The temperature at which the magnetic susceptibility increase occurs in affected samples coincides with the temperature reported for the desulphation of jarosite and its transformation to maghemite (Frost *et al*. 2005, 2007). This transformation at high temperatures can be used to infer the presence of material coming from the leak and delineate the affected area along the basin.

Keywords: thermomagnetic curves, jarosite, mine wastes pollution.

References

Frost, R.L., M.L. Weier, and W. Martens (2005), Thermal decomposition of jarosites of potassium, sodium and lead, *J. Therm. Anal. Calorimetry* **82**, 115–118.

Frost, R.L., D. Wain, W.N. Martens, A.C. Locke, J. Martinez-Frias, and F. Rull (2007), Thermal decomposition and X-ray diffraction of sulphate efflorescent minerals from El Jaroso Ravine, Sierra Almagrera, Spain, *Thermochimica Acta* **460**, 9–14.