^{57}Fe Mössbauer spectroscopy of pantelleritic melts

N. BOROVKOV[1]*, K.-U. HESS[1], K. T. FEHR[1], C. CIMARELLI[1], D. B. DINGWELL[1] AND A. GÜNTHER[1].

[1]Department of Earth and Environmental Science, Ludwig Maximilians Universität, Theresienstr. 41/III, 80333 Munich, Germany (*correspondence: nikita.borovkov@min.uni-muenchen.de)

Fe species in the melt can include 4-Fe2+, 5-Fe2+, 4-Fe3+, and 5-Fe3+. The relative proportions between these species can vary according to bulk glass composition and oxygen fugacity conditions. RedOx state and coordination of Fe can considerably affect important physical properties (density and viscosity) of magma, even where bulk composition and Fe content are constant. A set of silicate glasses with pantelleritic composition have been synthesized at different oxygen fugacity conditions (from air down to IW buffer) and then were analyzed by 57Fe Moessbauer spectroscopy (MB). The spectra were taken at 298K in transmission mode and fitted by applying an extended Voigt-based lineshape according to [1]. The MB spectra of all samples display three lines which can be described to two different doublets. One doublet with an isomer shift (IS) of ca. 0.9 mm/s relative alpha-iron and a quadrupole splitting (QS) of ca. 2 mm/s can be attributed to ferrous iron. The second doublet with IS of ca. 0.3 mm/s relative alpha-iron and QS of ca. 0.9 mm/s can be attributed to ferric iron. The later values are close to that of ferric iron on tetrahedral site in ferrobasaltic glasses [2]. With increasing oxidation the QS of ferric iron increases slightly from 0.85 mm/s (0.3 Fe3+/Fetotal) to 0.95 mm/s (0.8 Fe3+/Fetotal) where a decrease of QS for ferric iron as a function of oxidation was observed. The IS of 0.9 mm/s for ferrous iron remains constant up to an oxidation state of about 0.6 Fe3+/Fetotal and with increasing oxidation a rapid decrease to IS of 0.6 mm/s at 0.8 Fe3+/Fetotal occurs. At the oxidation state of 0.6 Fe3+/Fetotal the constant QS of 2.0 mm/s for ferrous iron increases up to 2.45 mm/s at 0.8 Fe3+/Fetotal in contrast to ferrobasaltic glasses, where a QS of 2.0 mm/s remains constant over the whole oxidation state [2]. Meanwhile, for tektites and alumino-silicate glasses [3, 4] the doublet with IS of 0.9 mm/s and 0.6 mm/s was attributed to ferrous iron on a five-fold and four-fold coordinated sites, respectively.

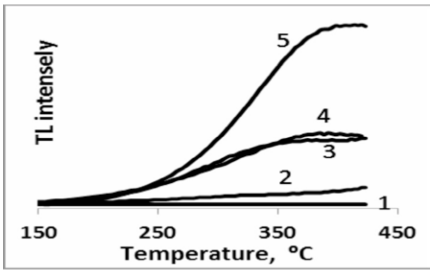
[1] Lagarec and Rancourt (1997) *Nucl. Instr. And Meth.* **B 129**, 266-280. [2] Botcharnikov *et al.* (2005) *Geochim. Cosmochim. Acta* **69**, 5071-5085. [3] Rossano *et al.* (1999) *Phys Chem Minerals* **26**, 530-538. [4] Rossano *et al.* (2008) *Phys Chem Minerals* **35**, 77-93.

Luminescence of products of hypergenesis ore deposits

N.N. BOROZNOVSKAYA, L.A. ZYRYANOVA, T.S. NEBERA AND A.V. PAVLOVSKAYA

Tomsk State University, Tomsk, Russia (boroznovskaya@mail.ru)

Luminescence analysis (L) can be successfully used in mineralogical studies of hypergene products. We studied the spectra of roentgenoluminescence (RL), and the thermoluminescence (TL) of minerals the oxidized zone Rubtsovsk deposit (Russia, Ore Altai). Found that the species composition of the loose mono and polymineral formations consisting of basic sulphate Cu, Pb, Al, and clay minerals can be determined from the characteristic spectra of RL and TL schedules. L studied minerals associated with defects in silicon-aluminum-oxygen tetrahedra, the excited states of oxygen and the presence of other native defects. Monoclinic dickite is diagnosed by the intense RL at λ = 350-360 nm, and very different from the triclinic kaolinite, which is characterized by weak luminescence in a wide wavelength range (285-300 and 340-350 nm). RL of kaolinite varies depending on the degree of crystallization and structural regularity. Halloysite is allocated by short-wave radiation with a peak in the spectral range 290-310 nm. In contrast to clay minerals alunite and osarizavaite spectra RL very low in intensity. Quantitative ratios of clay minerals and sulfates in their common units can be determined from the graphs of TL ignition minerals up to 450 ºC.



Studied the L of hypogene and hypergene barite. RL spectra of barite formed in the oxidation zone differ from those of RL hypogene barite primary sulfide ore intense radiation in the wavelength range of 350-400 nm due to the excitation of oxygen. Thus, the study of products of hypergene luminescence methods allow: 1) to determine the degree of crystallinity of the mineral aggregates and order of the crystal lattice of minerals; 2) to use the luminescence for diagnostic purposes; 3) to solve individual genetic issues.

This study was funded by the Russian Ministry of Education and Science (projects 5.3143.2011, 14.B37.21.0686, 14.B37.21.1257).

DOI:10.1180/minmag.2013.077.5.2
www.minersoc.org