

Fluorescent halite from Bochnia salt mine, Poland

Edyta Waluś (1), Dobrochna Głabińska (1), Aleksandra Puławska (2), Michał Flaszka (2), and Maciej Manecki (1)

(1) Department of Mineralogy, Petrography and Geochemistry, AGH University of Science and Technology, Kraków, Poland,

(2) Bochnia Salt Mine, Bochnia, Poland

The photoluminescence of selected halite crystals from Bochnia Salt Mine (Bochnia, Poland) were discovered in 2014. This is a result of contemporary precipitation from percolating waters. In most cases the fluorescence is observed in whole crystals or in zones of crystals. Only clear parts of transparent crystals are orange-red fluorescent in short UV light (320 nm). Chemical microanalysis by scanning electron microscopy/energy dispersive spectroscopy SEM/EDS indicates that this is activated by Mn and Pb. The concentration of Mn is similar in fluorescent and inactive salt and equals to 0.13 – 0.27 wt.%. The concentration of Pb, however, averages to 3.8 wt.% in fluorescent parts reaching only 1.9 wt.% elsewhere. There is no difference in the unit cell parameters determined by powder X-ray diffraction. The percolating waters contain some Mn (ca. 3.9 ppm) but the concentration of Pb is below the detection limits.

The experiments of precipitation of halite from the solutions containing various concentrations of Mn and Pb were performed to simulate this phenomenon using solutions containing: 1 mg Pb/L and 80 mg Mn/L; 1 mg Pb/L and 0.8 mg Mn/L; 1 mg Pb/L and 0.6 mg Mn/L; and 0 mg Pb/L and 80 mg Mn/L. The results indicate that fluorescence is apparent when halite forms from solutions containing more than 0.8 mg Mn/L and more than 1 mg Pb/L. The presence of lead as co-activator is necessary requirement: Mn alone does not activate the fluorescence of halite. This is in accordance with the results of previous work (Murata et al., 1946; Sidike et al., 2002).

Rock salt in the mine does not show fluorescence at all. Fluorescence of contemporary salt in Bochnia salt mine is a result of mining activity and slight, sporadic contamination with traces of Mn and Pb. This work is partially funded by AGH research grant no 11.11.140.319.

Murata K. J., Smith R. L., 1946. Manganese and lead as coactivators of red fluorescence in halite, *American Mineralogist*, Volume 31, pages 527-538

Sidike A., Kausachi I., Yamashita N., 2002. Energy transfer from Pb^{2+} to Mn^{2+} in fluorescent halite from Salton Sea, California, *Journal of Mineralogical and Petrological Sciences*, Volume 97, page 278-284