LATTICE PARAMETERS AND RAMAN SPECTROSCOPY OF SPHALERITE SOLID SOLUTION (Fe_xZn_{1-x})S AT THE STANDARD *T*, *p* CONDITIONS

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It is known, that lattice parameter a_o of sphalerite solid solution depends on Fe concentration, temperature and sulfur vapor pressure at annealing. When temperature and Fe concentration are increasing, growth of parameter a_o slows down distinctly. A curve or even a break on the $a_o=f(x)$ dependence according to different authors occurs at wide range of compositions ($0.1<x<0.25$) (Fig.1).

The question about the character of the changing of the function $a_o=f(x)$ is essential, whether it has a break or not. If there is a break, then there is a phase transition and possibility of appearance of diphasic area (maybe very narrow) at the FeS-ZnS pseudobinary diagram and dramatic changing of other physical and chemical properties of solid solution in this area. The last is confirmed, for instance, by abrupt growth of solubility of the third compound at $x>0.2$ and T=973K and spasmodic changing of FeS activity in sphalerites of different composition, which temperatures decrease naturally with the growth of FeS concentration. View of Raman spectra of sphalerite solid solution of different composition is shown in Fig.2.

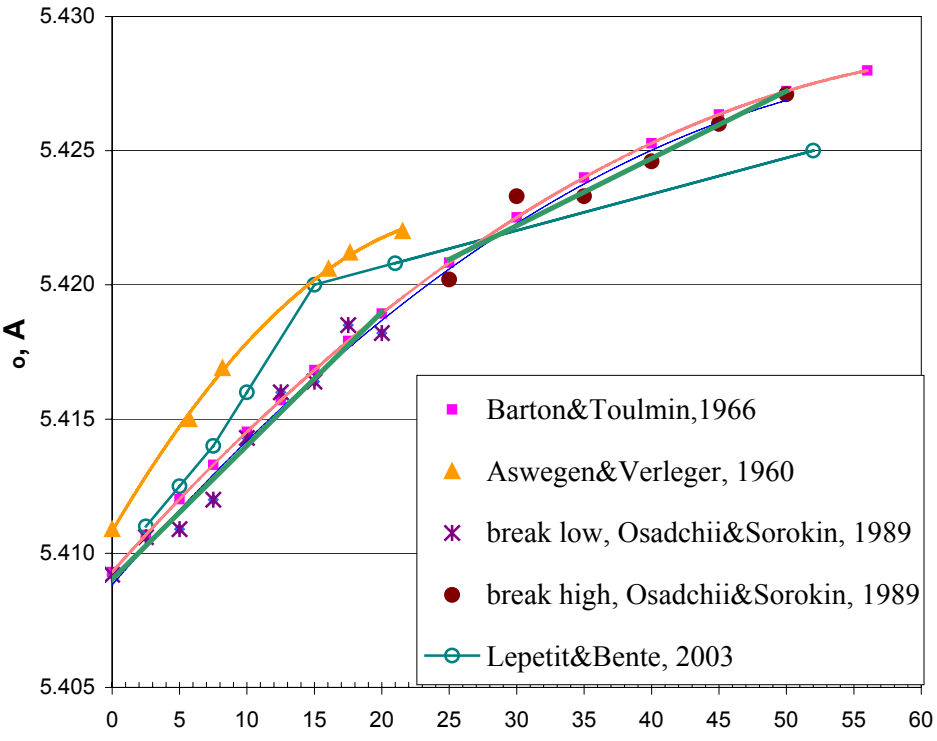

Fig. 1. Parameter –composition dependence of sphalerite solid solutions after literature data.

Data of Raman microspectrometry confirm the existence of a break at the $a_o=f(x)$ dependence on x=(0.20-0.25) with a high probability. The measurements were carried out at Renishaw RM1000 Raman spectometer with microscope LEICA DLML with lens ×50. 4-5 individual grains were investigated in every sample out of 12 sphalerite solid solutions. The ratio of areas of the peaks corresponding to vibrational bands Fe-S (~298см$^{-1}$) and Zn-S (~347см$^{-1}$) were chosen as an analytic parameter. This parameter dependence on Fe concentration shows abrupt break at FeS mole fraction about 0,20-0,25 (Fig.3).

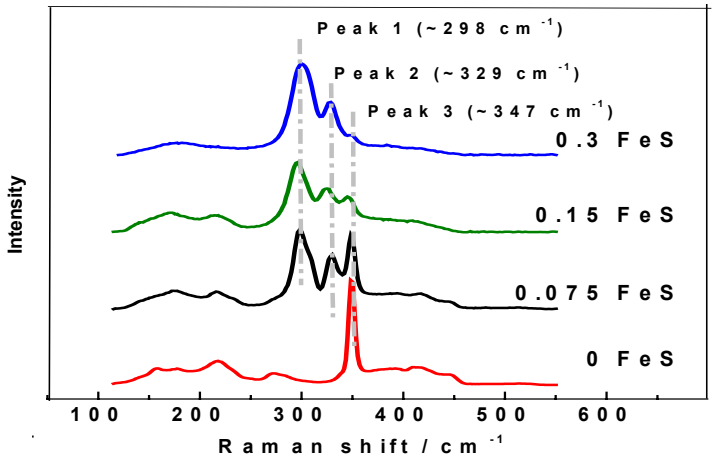

Fig. 2. View of Raman spectra of sphalerite solid solution of different composition.

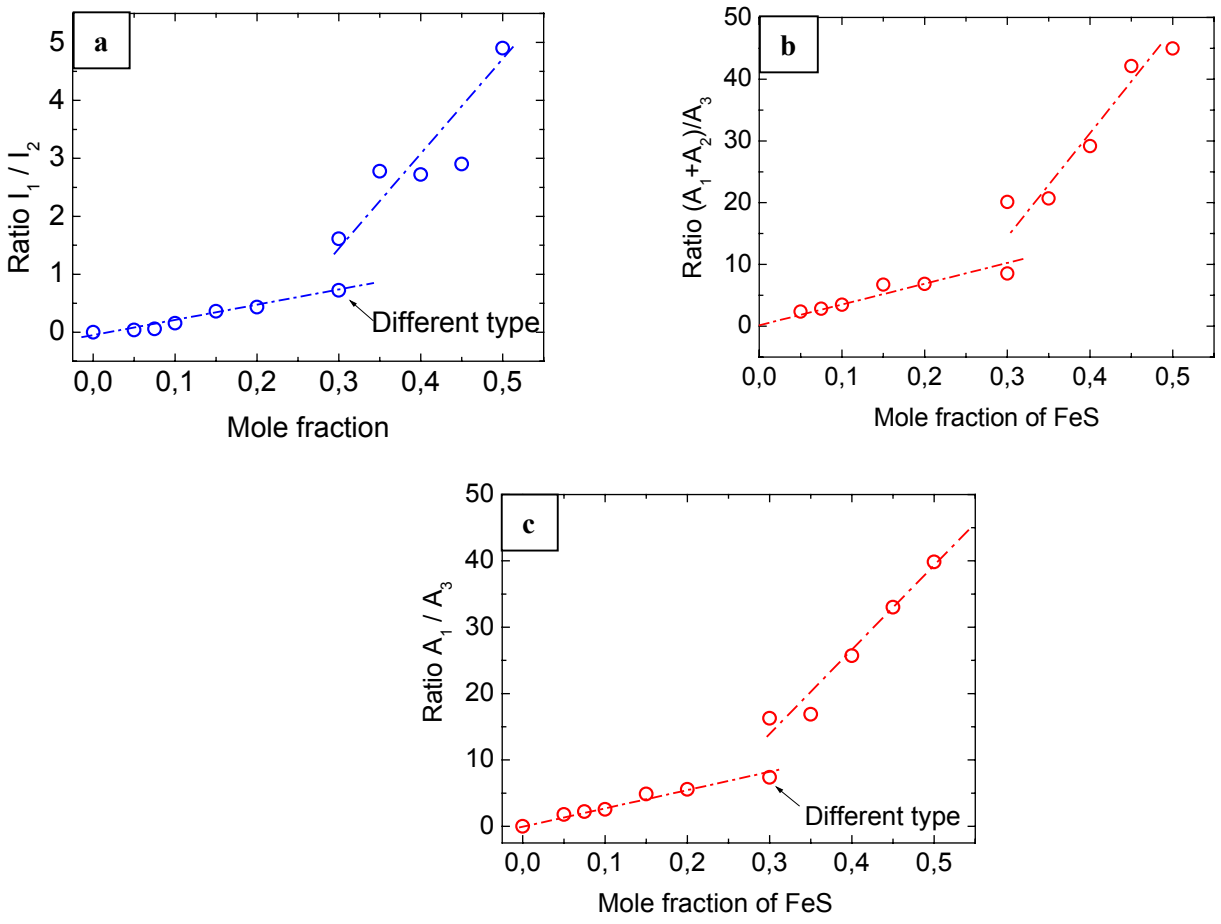

Fig. 3 (a, b, c). Results of processing of Raman spectra of sphalerites

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