

Low Temperature Mössbauer Spectra of Rozenite and Szomolnokite

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In nature rozenite ($\text{FeSO}_4 \cdot 4\text{H}_2\text{O}$) and szomolnokite ($\text{FeSO}_4 \cdot \text{H}_2\text{O}$) are secondary minerals found in the oxidation zones of sulfide deposits. In this study, Mössbauer spectra (MS) at 4.2 K of two natural (S60 and JB626) and two synthetic samples (Mel100 and Mel200) are presented. From the MS and the X-ray diffraction patterns, it is concluded that S60, JB626 and Mel100 are admixtures of two phases (rozenite and szomolnokite), whereas Mel200 is single phased szomolnokite.

At 4.2 K the MS of S60, JB626 and Mel100 consist of a superposition of a ferrous doublet (D1) and a magnetically split component (S2). The hyperfine parameters of D1 are characteristic for Fe^{2+} in rozenite, whereas those of S2 are typical for Fe^{2+} in szomolnokite. The MS at 4.2 K of Mel200 is a single magnetically split ferrous component (S2). The magnetic (sub)spectra were numerically analysed by a model-independent hyperfine field distributed component [1] of which the subcomponents were calculated from the diagonalization of the full nuclear interaction Hamiltonian [2]. The adjusted parameter values (for S2: with highest probability in the B_{hf} distribution) are indicated in Table 1.

Table 1: Mössbauer parameters at 4.2 K for rozenite and szomolnokite phases.

Sample	T K	Spectral component	δ mm s^{-1}	ΔE_Q mm s^{-1}	η	B_{hf} T	Ψ $^\circ$	Ω $^\circ$	Γ mm s^{-1}	Area %	Identification
JB626	4.2	D1	1.38	3.50					0.37	38	rozenite
		S2	1.39	3.09	0.68	32.7	37	63	0.35	62	szomolnokite
S60	4.2	D1	1.40	3.55					0.36	20	rozenite
		S2	1.39	3.13	0.91	32.5	38	65	0.32	75	szomolnokite
Mel100	4.2	D1	1.38	3.48					0.36	73	rozenite
		S2	1.38	3.10	0.94	32.4	38	65	0.26	27	szomolnokite
Mel200	4.2	S2	1.38	3.07	0.59	32.5	37	63	0.30	100	szomolnokite

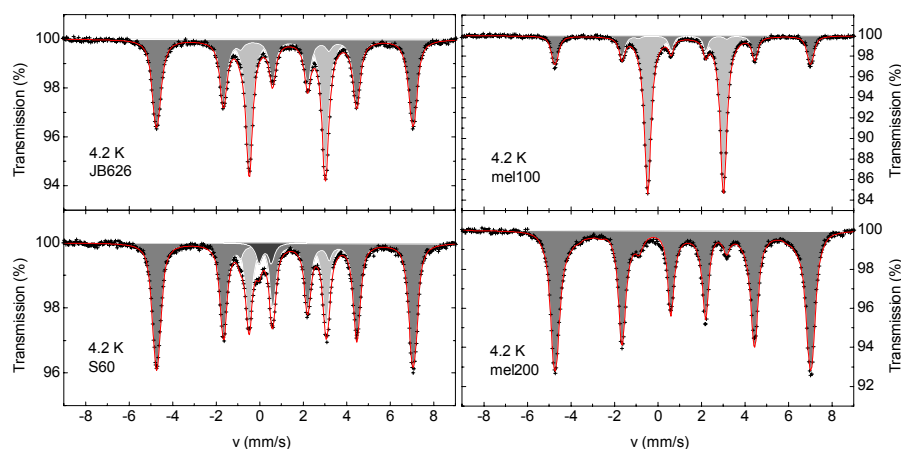


Fig. 1: Mössbauer spectra of the samples at 4.2 K (light gray: D1; gray: S2)

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 [2] G.R. Hoy, S. Chandra, J. Chem. Phys. 47 (1967) 961-965.