SINGLE-CRYSTAL RAMAN SPECTROSCOPY OF VESUVIANITE GROUP MINERALS IN THE OH REGION

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Minerals of the vesuvianite group with formulae $X(1\text{-}3)_{18}X'(4)Y'(1)Y(2,3)_{12}T(1,2)_5[Z(1,2)O_4]_{10}[Z(3)_2O_7]_4W_9O_{1\text{-}2}$ (Z = 2) are presented by "rod" polytypes: *P4/nnc*, *P4/n*, *P4nc* (ARMBRUSTER & GNOS, 2000). Symmetry of vesuvianite is defined by string ordering of 4 cations at 8 channel positions (*Y'*, *X'*). Character and the number of IR and Raman bands poorly depend on the symmetry of the polytype and in general will be assigned by local site arrangement. Principle of the local site arrangement analysis was before used by GROAT et al. (1995) for interpretation of vesuvianite IR spectra in OH region. The cation composition of *Y*(3) sites, presence of B, Al at *T*(1), OH → F substitution at O(11) and hydrogarnet defects at *Z*(1,2) have principal influence on position and character of OH-bands of the Raman spectra in the region 3300-3700 cm^{-1} (Fig. 1, Table 1). The bands of OH groups taking part in formation of strong H-bonds (<3300 cm^{-1}) will be defined by cation composition at *Y'*(1), presence of B at *T*(2) and OH → F, Cl substitution at O(10)H(2) (Fig. 1, Table 1).

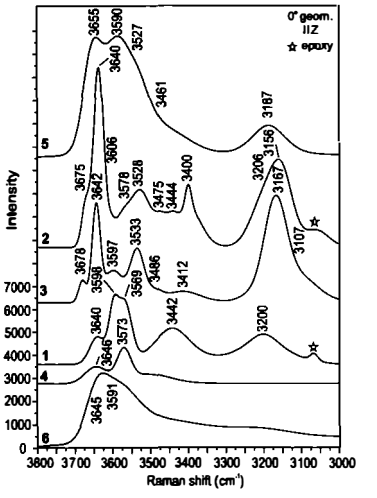

Fig. 1. Raman spectra of vesuvianite

Table 1. Symmetry and site occupation of investigated vesuvianite group minerals

		Y(1)	Y(3)	W [O(10)+O(11)]	T	Z
1.	*P4/nnc*	1Fe	6.1Al + 1.2Mg + 0.4Ti + 0.3Fe	4.5OH + 3.1F + 0.4Cl	0	18
2.	*P4/n*	0.6Fe + 0.4Mg	7.2Al + 0.8Mg	9OH	0	18
3.	*P4/n*	1Fe	5Al + 2Mg + 1Fe	~9OH	0	18
4.	*P4/nnc*	0.6Fe + 0.4Mg	4.3Mg + 3Al + 0.6Fe + 0.1Ti	0.3F + 0.nOH	4.2B	17.6Si + ?
5.	*P4nc*	1Fe (+Mg?)	3.7Al + 3.1Mg + 1.2Fe	~5OH + 0.5F + 0.3Cl	1.4B + 0.5Al	17.5Si + 2OH
6.	*P4/nnc*	0.5Fe + 0.5Mg	7.8Al + 0.2Fe	~6.3OH + 0.4F + 0.1Cl	0.6B	16.25Si + 7OH

1 – vesuvianite-F, Polar Yakutia, Russia (GALUSKIN et al., 2003a); 2 – vesuvianite-Al-OH, Kazakhstan; 3 – vesuvianite-OH, Ural, Russia; 4 – wiluite, Wiluy, Yakutia, Russia; 5 – vesuvianite-B, Wiluy, Yakutia, Russia; 6 – Si-deficient vesuvianite ("hydrovesuvianite"), Wiluy, Yakutia, Russia (GALUSKIN et al., 2003b).

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