

Luminescence of forsterite and clinohumite as the reflection of their crystallochemical features

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Impurity ions of transition elements may have different oxidation states and occupy different positions in crystal lattice of forsterite, and such changes are reflected in X-ray luminescence (XRL) spectra in forsterite from Pamir Mountains. Luminescence of following luminescence centers was recorded: Mn^{2+} – 640-660 nm, Cr^{3+} (supposedly) – 770-800 nm and Cr^{4+} – in 1000–1150 nm range [1]. Luminescence of $Cr^{3+}_{(M2)}$ and V_{Mg} associates (850-900 nm), $Cr^{4+}_{(Si)}$ (1120 nm) and wide-band luminescence of Cr-Li associates occupying position of Mg (950 nm) in artificial compounds was described previously [2]. The figure shows presence of these luminescence centers in studied samples. Clinohumite luminescence also may be related to Mn^{2+} (630 nm) substituting Mg^{2+} , Cr-Li associates (950 nm) substituting Mg^{2+} and $Cr^{4+}_{(Si)}$ (1000-1200 nm). Oxygen excess related luminescence in UV range may reflect oxidizing conditions of mineral formation. Besides that, there's an intensive luminescence (550 nm) related to Ti^{3+} occupying magnesium positions with following formation of exchange-bonded Ti^{3+} – Ti^{4+} pairs with charge transition [3].

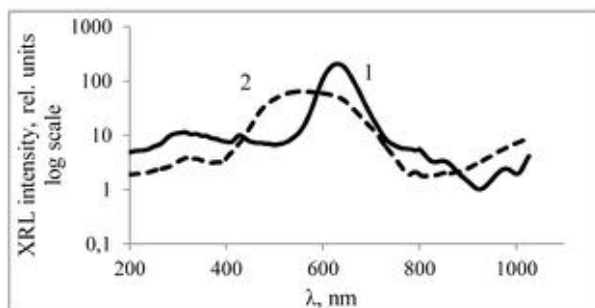


Figure: XRL spectra of forsterite (1) and clinohumite (2)

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- [1] Aseev *et al.* (2014) *Scientific and Technical Journal of Information Technologies, Mechanics and Optics* **92**, 57-61.
 [2] Dudnikov *et al.* (2011) *Physics of the Solid State* **53**, 2118-2128. [3] Nikolskaya *et al.* (1999) *Zapiski RMO* **2**, 93-98.