

LUMINESCENCE BEHAVIOUR AND RAMAN CHARACTERIZATION OF RHODONITE FROM TURKEY. N. Can¹, J. Javier Garcia Guinea², M. Hatipooglu³, R. Kibar¹ and A. Cetin¹, ¹Celal Bayar University, Faculty of Arts and Sciences, Physics Department, 35140 Manisa-Turkey, email;cannurdogan@yahoo.com

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A large massive-structured pale pink-colored mass, which is an element of the secondary replacement mineralisation paragenesis and is covered and interfered with the massive manganite mass, are found in the Menderes-İzmir region of the western Anatolia, only found in one deposit in Turkey. But, they do not occur as a single mineral. Instead they are polycrystalline and consist of the sub-microscopic mixing of rhodonite, anorthoclase, calcite, and quartz minerals. However, the rhodonite is the main constitutive element having over 60% of total of these masses, since the production of typical pinkish color is due to the presence of the abundance of rhodonite. Therefore, these masses should be stated as silica-rich rhodonite, and formulized as [(Mn,Ca,Fe,Mg)SiO₃]. These rhodonite masses consist of some unusual major components of SiO₂ (67.01%), Mn (18.61%), CaO (6.77%), Fe₂O₃ (0.97%), Al₂O₃ (0.37%), and MgO (0.36%), as well as a lot of trace elements. The crystal structure of the sample were analysed by X-ray diffraction (XRD) measurement. Samples of rhodonite display some distinctive dispersive (visible) confocal micro-Raman shifts and spectral luminescence emissions of cathodoluminescence (CL), photoluminescence (PL), and radioluminescence (RL). As might be expected it is impossible to show all spectra here. Therefore we will give CL data as an example as rhodonite exhibits strong CL which is very rare (see Fig. 1). We suggest that the important amount of manganese must destroy the CL emission. Fig. 1 shows CL emission spectra of rhodonite at room temperature. As seen from the figure, rhodonite exhibits luminescence maxima at 310, 425 and 626 nm. The Fe³⁺ and Mn²⁺ ions are isoelectronic with 3d⁵ configuration. Their absorption and luminescence are well known.

The optical absorption and Raman spectroscopy of rhodonite were reported earlier [1-2] and studies of the surface properties using glancing X-ray techniques undertaken [3-4]. As far as we are aware no previous work on rhodonite luminescence has been performed. If the assumption is made that rhodonite structure is similar to an orthosilicate and that a large cation perturbs the tetrahedral SiO₄ units, then an analysis of the Raman spectra of rhodonite should be able to be undertaken. Indeed a comparison between rhodonites from different origins has been made [2] but there is no work on Turkish rhodonite. A tetrahedral SiO₄ molecule not involved in distortion should have four vi-

brational modes. An intense band at around 668 cm⁻¹ was assigned to the v₄ bending mode and showed additional bands exhibiting loss of degeneracy of the SiO₄ units. The low wave number region of rhodonite is complex. A strong band at 408 cm⁻¹ is attributed to the v₂ bending bond. Our results are in good agreement with earlier work [2] but some subtle differences have been observed. We suggest that these differences depend on the cationic substitution of Mn by Ca and/or Fe²⁺ and Mg.

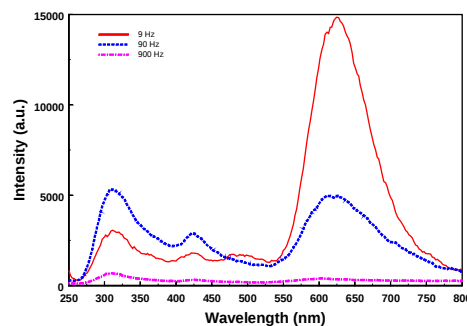


Fig.1 CL spectra for rhodonite at modulation frequencies ranging from 9 to 900 Hz at room temperature

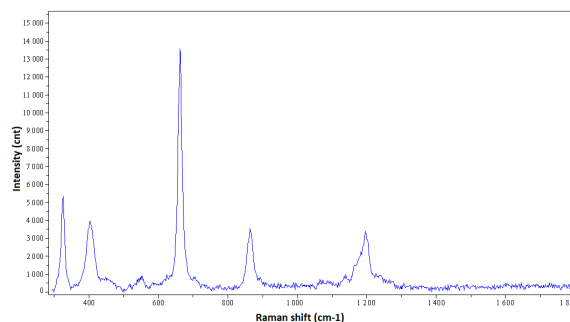


Fig.2 Raman spectrum of the 300-1800cm⁻¹ region of rhodonite from Turkey.

References: [1]Lakshman S.V.J. et al. (1973) *Physica*, 66(3), 601-610. [2]Mills S.J. et al. (2005) *Spectrochimica Acta Part A*, 62, 171-175. [3]Farquhar M.L. et al. (2003) *Min. Mag.*, 67(6), 1205-1219. [4]Petit P.E. et al. (2001) *J. Synch. Rad.*, 8, 952-954.