Raman spectra of the olivenite, clinoclase and cornubite minerals from Špania Dolina Cu (Ag) mineralization, Slovakia

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The hydrothermal Cu (Ag) mineralization at Špania Dolina ore-field (located in the southwestern side of Nízke Tatry Mts.) is developed within a 4 km long and 1.5 km wide zone, with a N–S direction as a part of quartz-sulfides carbonate vein mineralization. The ore mineralization is located in migmatitic paragneiss and Permian metasediments, consisting of greywackes, arkoses, schists and conglomerates. The Špania Dolina abandoned deposit is known for variegation of secondary minerals and for some very rare secondary Cu-arsenate and -sulphate minerals.

The Cu-arsenate olivenite, clinoclase and cornubite have been characterized using Raman spectroscopy. The tetrahedral AsO_4 molecule, which belongs to the T_d point group, is expected to show only four Raman-active normal modes of vibration (i.e. $A_1 + E + 2F_2$), where the trends ν_3 (F_2) > ν_1 (A_1) and ν_2 (E) > ν_4 (F_2) hold for the majority of the compounds (Nakamoto, 1997). The symmetry of the tetrahedral AsO_4 molecule in the investigated minerals is reduced to C_1 site symmetry. As a result, the four normal modes of vibration are splitting into 9A (IR, R). Raman spectra of olivenite reveal eleven bands, whereas those from clinoclase and cornubite show eleven and nine modes of arsenate stretching and bending vibrations, respectively. The most characteristic stretching and bending vibrations of olivenite occur at 855, 817, 801, 549, 527, 512, 499, 364, 346, 333 and 310 cm^{-1}, whereas those of clinoclase at 879, 846, 832, 771, 602, 561, 520, 474, 395, 375 and 324 cm^{-1}, and those of cornubite at 837, 821, 765, 519, 475, 447, 412, 386 and 355 cm^{-1}.

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Reference:

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