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RAMAN SPECTROSCOPY ON GEM-QUALITY MICROCRYSTALLINE AND AMORPHOUS SILICA VARIETIES FROM ROMANIA

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Raman spectroscopy is used as a powerful tool for mineral phase identification in geological samples, and for characterizing the crystal chemistry of heterogeneous materials. A special case is represented by mineral polymorphs, such as the SiO_2 phases. On the basis of optical microscopy, microcrystalline silica (low- or α-quartz) has been usually reported as "chalcedony", "jasper", "chert", or "flint" Previous micro-Raman investigations (KINGMA & HEMLEY, 1994) have evidenced the presence of a new tetrahedrally coordinated silica polymorph, *i.e.* moganite in virtually every studied microcrystalline silica sample.

In order to test the ubiquity of moganite in such geological materials, and for checking if a relationship between the colour/textural variations *vs.* the presence of specific polymorphs could be established, micro-Raman measurements were performed on gem-quality microcrystalline and amorphous silica varieties from several Romanian occurrences. The best studied occurrence was Gurasada (Apuseni Mts.), due to the remarkable diversity of SiO_2 varieties found in Paleocene („banatitic") pyroclastic agglomerates and tuffs: chalcedony (including agate), jasper, opal, silicified wood. Most of the samples show macroscopic and/or microscopic variations in colour (grey-red-blue-white), transparency or texture (from massive to banded). Other studied occurrences from the Apuseni Mts. were Rachiş and Techereu (both of "ophiolitic" pyroclastic origin), but also famous sites from Baia Mare area (Trestia and Oraşu Nou - related to the Neogene volcanism) were included for comparison.

The measurements were performed on a Dilor Labram system equipped with an Olympus LMPlan Fl 50 microscope objective, an 1800 lines/mm grating and an external laser with an emission wavelength of 514 nm, and additionally 632 nm. In the recording of the micro-Raman spectra a power of 100 mW on the sample has been employed. The focal length of the spectrometer is 300 mm and the slit used for all measurements was 100 μm. Thus, the spectral resolution was about 4 cm^{-1}

The Raman spectra show the presence of low-quartz in all the microcrystalline silica varieties (chalcedony, agate, jasper), but also in some areas of the studied opals. The shoulder of the 465 cm^{-1} quartz band which is noticeable at values around 500 cm^{-1} is interpreted as an evidence of an intergrowth with moganite (KINGMA & HEMLEY, 1994), thus present in small amounts in most of the studied samples (including opal). The pattern of the coloured areas could not be correlated to the presence of a specific silica polymorph; however, in some cases certain non-silica phases (such as calcite, or organic carbon sp2-containing phases) may be responsible for the observed colour and/or transparency variations.

References

KINGMA, K.J. & HEMLEY, R. (1994): Am. Mineral., **79**: 269-273.