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GEOCHEMICAL AND MINERALOGICAL CHARACTERIZATION OF TOPAZ: A COMPARISON BETWEEN BRASILIAN AND PAKISTAN STONES

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Brazilian and Pakistan topaz are commercially known as top quality gems. This study is aimed to characterise chemical composition and mineralogical structures of selected samples of the two localities (Minas Gerais, Brazil; Gilgit – Baltistan, Pakistan) to find possible crystallochemical clues to apply at stones of unknown provenances. Topaz, $\text{Al}_2\text{SiO}_4(\text{F},\text{OH})_2$, is one of the most important F/OH-bearing silicates (Gatta et al., 2006), and its formation is associated to pneumatolithic/hydrothermal events occurring in silicic igneous rocks (i.e., mostly granites and rhyolites). Commonly, the gem-quality topaz crystallise in a granitic pegmatoid matrix variously coloured topaz gems are widely used in jewellery, while colourless or light-blue stones have not relevant commercial value. The most precious topaz gems come from Brazil, Russia, Japan and Pakistan, but also from several European countries (in Saxony Region). A multi technical approach has been used and the selected samples divided into two fractions for spectroscopic/spectrometric and diffractometric analyses to examine modification in topaz crystal structure caused by F-OH- substitution, and to determine the compositional features of topaz from Brazil and Pakistan.

The chemical characterization was carried out combining X-Ray Fluorescence (XRF), Raman spectroscopy, and Scanning Electronic Microscopy (SEM-EDS). Afterwards, on the basis of the obtained results, a selection of samples, representative of the main geochemical characteristics of both regions, have been characterized by X-ray powder diffraction; data were collected at the high resolution beamline ID22 at the European Synchrotron Radiation Facility (ESRF, Grenoble, France). Cell parameters were calculated from X-ray diffraction data by means of the Rietveld method and fluorine content (wF) was estimated by a and b unit-cell dimension. A critical correlation of the wF versus the refined lattice parameters and the known data allowed us to improve the regression lines for wF versus a and b cell edges (Alberico et al., 2003). Major and trace-element (including REE) data obtained by XRF, Raman and SEM – EDS techniques, document the occurrence of typical REE fractionation patterns in topaz in spite of the different origin and composition of the host rock.

[1] Gatta G.D. et al. 2006. *American Mineralogist*, 91, 1839-1846

[2] Alberico A. et al. 2003. *European Journal of Mineralogy*, 15, 875 - 881.