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A trace-element study of tourmalines from the Passagem de Mariana gold mine tourmalinites (Minas Gerais, Brazil) by LA-ICPMS

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A trace-element study was carried out in three types of tourmaline from tourmalinites of the Passagem de Mariana Gold Mine (Minas Gerais, Brazil). *In-situ* analyses were performed in the IGc-USP Laboratory of Chemistry and ICP, equipped with a New Wave UP-213 laser ablation system coupled to an Elan 6100DRC ICP-MS. Ultrasound cleaned, 80 mm-thick polished tourmalinite sections were analyzed. Diameter crater varied from 40 to 65 mm when in spot mode and from 30 to 40 mm at a 2 mm/s speed when in raster mode. Average time of analysis was 120 s. Reference materials used for calibration were synthetic glasses BHVO-2G, BCR-2G (USGS) and SRM-612 (NIST). The results were treated during each analysis by means of the Glitter 4.4.2 software for instrumental drift and fractionation corrections adopting NIST SRM-612 as internal standard. MgO contents obtained by EPMA were used to adjust each analysis.

Type-1 tourmaline is very fine-grained and composes massive tourmalinites occurring as continuous or boudinaged bodies and as fragments in quartz-carbonate veins and breccias. Type-2 tourmaline is fine-grained, color-zoned and constitutes massive and banded tourmalinites. Type-3 tourmaline is coarser-grained and color-zoned, grown with long axis perpendicular to the contact of tourmalinite fragments with quartz-carbonate matrix in veins and breccias (comb texture). The three types of tourmaline are Mg-rich (Mg# from 0.64 to 0.73). EPMA analyses suggest sector zoning, characterized by decreasing SiO_2 and Al_2O_3 and increasing MgO, Na_2O, F and in particular CaO with increasing TiO_2 contents. In type-2 tourmaline, it corresponds to color zoning, once greenish zones yield TiO_2 <0.5 wt.% and brownish zones yield TiO_2 >0.5 wt.%.

Trace-element variations attest for sector zoning in type-1 and type-2 tourmalines, with increase in Sr, Ni, V, Pb, Y and REE contents with increasing Ti. In contrast, trace-element variations in type-3 tourmalines follow a different pattern, with very low, almost constant Co, Ni, Hf, Zr, Y and REE contents and low Sr and Pb and high V contents, which increase as Ti increases. When compared to type-1 and type-2 tourmalines these variations indicate charges in the host environment, probably caused by gold-mineralizing fluids associated with veining and brecciation.

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