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Spectroscopic study of bicolored yellow-green beryl from Padre Paraíso, Brazil

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Uncommon, bicolored yellow-green beryl ($\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$) was discovered in the Padre Paraíso Pegmatitic District, at the NE of the Minas Gerais state, Brazil. These exceptional, transparent, gem-quality crystals are up to 20 cm long. They occur in a particularly homogeneous, subvertical, tabular pegmatitic body, which has a thickness of less than 2 m and is hosted by the Paraíso charnockite [1]. The yellow and green beryl samples were investigated with various techniques in order to characterize and decipher the origin of color. Methods applied include powder X-ray diffraction, electron microprobe analyses, ICP-AES, UV-Vis and X-ray absorption spectroscopy. No remarkable difference in composition was found between the yellow and green samples, implying that the fluids, which generated the crystals, did not change. The average chemical composition corresponds to alkali-poor beryl with small, but, significant amounts of Cs (~0.5 wt%). No REE have been detected. X-ray absorption spectroscopy on the Fe edge was used since this element-specific technique provides crystal chemical information that is complementary to X-ray diffraction data by revealing the site occupancy and valence state of Fe, even for such small amounts (~0.4 wt%). Furthermore, the amount of Fe^{3+} present is an indicator of the oxygen fugacity conditions prevailing during beryl crystallization. It was found that the iron ions mainly occupy the octahedral sites and that the $\text{Fe}^{2+}/\text{Fe}^{3+}$ ratio in both samples is similar, revealing the presence of comparable oxygen fugacities at the moment of formation. Furthermore, the change in color can not be associated with the presence of Fe^{3+} . UV-Vis spectroscopy and chemical analyses suggest that the color is most probably caused by trace elements. Additional measurements are in progress.

References

- [1] Pinto C.P., Drumont J.B.V., and Féboli W.L.C. (1997) *CPRM*, 161 p.

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The experimental study of Co-Ni-(Fe)-PGE- sulfarsenide stability

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The investigations of pseudoquaternary systems (“PGE”, Co, Ni, Fe)AsS were carried out to confirm preliminary data [1]. According to the microprobe data the As:S ratio in “PGE”- and “PGE”- bearing SAS varies significantly. The cause of these variations remain unclear, along with the stability conditions of synthesis. The experimental study under controlled sulfur fugacity, with the aim to determine the position of sulfarsenide stability fields, was carried out at 873 °K through the use of sulfide buffers. Poh, Fe0.985S, and Pyr+Po, Fe0.959S presented buffers. As starting materials the Co-rich Pt/Ir/Rh-bearing associations were chosen. The composition and phase relationship of reaction products were investigated in detail with a microprobe and SEM aided by EDD (LINK).

All SAS synthesized belong to the section “Mss (MeS_2) + “PGE”AsS + MeAsS + “PGE”As₂ (“PGE”As). The experimental products are very fine-grained aggregates of Co(Ni,Fe)-SAS with tiny inclusions of PGE-SAS, or with PGE-arsenides and Fe, Co, Ni-sulfides, mainly Mss. Two types of phase associations, “PGE- sulfarsenide + (Co, Ni, PGE)-sulfarsenide” and “sulfarsenide + sulfide + arsenide”, are present in experimental products. Results are in agreement with data on phase relationships in PGE-As-Fe-Ni-Cu-S system [2].

The As content in SAS increases when the T° increases. In general PGE content in SAS increases as $\lg f_{\text{S}_2}$ increases. Rh- and Ir- SAS are stable in the pyrrhotite stability field. PtAsS is replaced by PtAs₂ under both $\lg f_{\text{S}_2}$. The “PtAsS/PtAs₂” equilibrium line corresponds to higher $\lg f_{\text{S}_2}$ than “IrAsS/IrAs₃” and “RhAsS/PhAs₂” ones. Under $\lg f_{\text{S}_2}$ of Pyr+Po buffer As:S in SAS is close to 1:1. Sulfides in products of experiments are presented by Fe_{ss} , ~ $\text{Fe}_{0.82-0.89}\text{S}$, (Fe, Ni)_{ss}, and CoS. If reaction leads to S enrichment in buffer Po and in SAS, PGE-arsenides (diarsenides) are formed.

The EM data will allow an understanding of the cause of sulfarsenide composition variations: high PGE-concentrations in natural and experimental SAS are combined due to the presence of tiny (<0.1- 2 μ) grains of PGE-SAS or arsenides (Co, Ni, Fe) SAS matrix.

References

- [1] Evstigneeva et al. (1994). *Abstr. VII Int. Pt Symp.*, M. P.38
[2] Evstigneeva et al. (2002). *Geochim. Cosmochim. Acta*, **66**, 15A, A219