

SULFATE-BEARING FLUIDS IN EMERALDS FROM THE COQUI OCCURRENCE, CEARA STATE, NE BRAZIL.

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The emerald occurrences of Coqui, Ceara State, NE Brazil, (1) are spacially associated with lenses of pegmatites (age 0.5-0.7 Ga) characterized by regional colombo-tantalite and cassiterite mineralizations. Emerald crystals grow within wall-rock metasomatised zones developed around the pegmatitic bodies. Lepidoblastic assemblages of phlogopite ($Fe/Mg=0.24-0.33$; $Al\ VI=0.49-0.69$), quartz, plagioclase ($An=20-35$) and apatite characterize these metasomatic zones. The genesis of the Coqui emerald mineralization is similar to the other described emerald deposits of Brazil (2): it can be attributed to an infiltrational metasomatic process related to highly differentiated intruding granites and pegmatites provoking a K-metasomatism of the basic-ultrabasic wall-rocks metamorphic series.

The Coqui emerald crystals are characterized by low Cr (250 ppm) and relatively high Na_2O (0.54-0.62 %) contents. Paleo-fluid formation studies were performed on primary cylindrical elongated inclusions developed along the c-axis of the crystals as well as on primary and secondary quadratic-section shape cavities.

Thermo-optic, Raman-probe and SEM experiments reveal extremely complex and high salinity fluids. $T_{eutec.} = -45^\circ C$ to $-36^\circ C$, $T_{fg} = -3.7^\circ C$ to $-2.7^\circ C$ and $T_{fclath.} = -4.2^\circ C$ to $+3^\circ C$. Bulk homogenisation of the liquid-vapor phases occurs at $235^\circ C-300^\circ C$ in liquid phase. No halite crystal has been found. The vapour bubbles (20 vol% of the cavity) contains CO_2-N_2 mixture (molar prop. $CO_2/N_2 = 2.3-0.43$) without CH_4 or H_2S . Direct Raman probing on the liquid phase and on hydrates formed during cryometric runs show the presence of SO_4^{2-} (0.01-0.1 molal). Solid phases determined by Raman microprobe in unopened inclusions are quartz, siderite, calcite, muscovite, albite and an isotropic Raman

inactive solid, presumably sylvite. Therefore, additional dissolved anion might be Cl^- equilibrating KCl daughter crystals into the cavities. Opening of the cavities leads to the precipitation of complex S-Cl-bearing salt mixtures with Fe, Ca, Mg, Cu, Cr, K identified by SEM. Isolated crystals of Cl-Fe are also present together with quartz, béryl, calcite, wollastonite, talc, Fe (Hématite ?), muscovite and a biotite-plagioclase assemblage characteristic of the metasomatized wall-rock.

The primary fluid inclusions trapped into the Coqui emerald crystals are clearly related to the metasomatic process involved in the genesis of this occurrence. The presence of sulfate together with CO_2 and the absence of CH_4 and H_2S demonstrate the oxidizing character of the fluid. The high salinity and $\text{SO}_4^{2-} + \text{N}_2$ content of these primary fluids suggest an origin by leaching of evaporitic series.

References:

- (1) R.M. Castelo Branco et al., Anais do XXXV Congresso Brasileiro de Geologia, Belem, Para, 1988, V.1, p. 383-397.
- (2) G. Giuliani et al., Mineral. Deposita 25, 57-64, 1990.

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