

## H<sub>2</sub>O-NaCl-CaCl<sub>2</sub>-BEARING FLUIDS IN EMERALDS FROM THE VEGA SAN JUAN MINE, GACHALA DISTRICT, COLOMBIA.

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The Gachalá emerald district (Vega San Juan, Las Cruces, El Diamante, El Toro mines) forms part of the eastern belt in the *Oriental Colombian Cordillera*. Lithological (the Berriasian *Guavio* black shales formation) and structural (the intersection of reverse NE-SW and NW-SE fault systems) factors control the localization of emerald mineralizations in the Vega San Juan mine. Emerald crystals occur in calcite-dolomite veins, pockets and brecciated zones.

The chemical composition of primary fluid inclusions in emerald crystals was investigated by microthermometry, SEM and Raman techniques. Fluid inclusions are either three-phased (Type 1) or multiphased solid inclusions (Type 2). Type 1 corresponds to the association of halite (H), brine (L) and gas (G) phases. Type 2 is constituted by L-G and daughter minerals mainly halite, composite Ca-Fe chloride salts and KCl. CO<sub>2</sub> is absent in both types. Raman analysis on solid phases from Type 2 determined calcite and carbonaceous compounds. The presence of CaCl<sub>2</sub>-NaCl brines is clearly evidenced by SEM and by eutectic temperatures ranging from -56.1° to -52°C with final melting of ice (T<sub>mj</sub>) between -35.3 to -31.6°C.

T<sub>f</sub> halite (T<sub>fh</sub>) ranges between 284°-326°C (mode 300°C). Liquid-vapor homogenization temperature in liquid phase (T<sub>hL</sub>) ranges between 215° - 330°C (mode 235°C). Combination of T<sub>fh</sub> and T<sub>mj</sub> allows the estimation of total salinity of the fluid: (H<sub>2</sub>O)<sub>55</sub>-(NaCl)<sub>30</sub>-(CaCl<sub>2</sub>)<sub>15</sub>.

Constant T<sub>fh</sub> shows that the fluid was essentially homogeneous at trapping temperature. Meanwhile, some T<sub>fh</sub> > 300°C for T<sub>h</sub> = 250°C indicates that the solution was at the limit of supersaturation. In this case, it can be admitted that T<sub>fh</sub> can be the real temperature of inclusion formation (T = 300°-350°C, P = 1.3-1.5 Kb).

The presence of NaCl-CaCl<sub>2</sub> brines in the primary fluid inclusions of the emerald crystals suggests for the hydrothermal fluids an origin by leaching of underlying evaporitic levels.

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