Pyrite components in Colombian emeralds

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***Colombia, emerald, pyrite, sulfur, fluids, euhedral*.**

I – Components and residues in Colombian emeralds

Often, Colombian emeralds contain solid residues. Carbonates, halites, silicates, sulfurs, and sulfates are the most frequent of these minerals included in euhedral crystal shapes **(*figure 1*).**

In some cases, if the mineral component is formed before the crystallization of the emerald, it is called *proto-genetic* (or prototype). When it crystallizes at the same time as the emerald, it is called singenetic.

II – The formation process of emeralds

Marine sediments contained in emeralds have undergone a thermo-chemical reaction in which the organic matter they contain, along with sulfates and sulfurs, play a key role in the reduction of silicates, and the ensuing interaction with the marine fluids present in the pores of the rock. These fluids have allowed lixiviation, migration and deposition of mineralized ions. Such ions are transported through regional faults caused by hydraulic fractures that precipitate into local fault in the form of emeralds. The same thing occurs with some other minerals in favorable sites controlled by tectonics associated to the geological history of the Colombian Eastern mountain range.

The study of the three-phase trapped fluids and the isotopic analysis of the pyrite (FeS2) found in the emeralds from the Eastern region (Chivor, Gachalá, Achiote) and from the Western region (Maripi, Muzo Coscuez, Peñas Blancas), have confirmed their sedimentary evaporitic origin, setting a distance with any association of the mineralized fluids with igneous or metamorphic matter. Salt mounts or domes are present in the zones of emerald deposits in the surroundings of Bogota (Mines in Zipaquirá and Nemocón). The formation of emeralds dates back to the end of the Paleogene period: Eocene-Oligocene (38-32 Ma).

III – Pyrite inclusions

Pyrite inclusions (0.2-5cm) present themselves in crystal shapes and the combination of dodecahedron and pyritohedron is frequent (**figures 2, 4, 5, 6***)*. Cubic is rarer (**photo 3).** Crystals are usually isolated inside the emerald, but are also likely to form groups (**figures 5,6**).

Note from the translator: References to the figures and photographs are hereby provided so the reader may find them in the original French document.

Figure 1: *Pyrite and rhombohedral carbonates – Magnification 34 X.*

Figure 2: *Euhedral pyrite crystals - Magnification 34 X*

Photo 3*: Pyrite cube*

Figure 4: *Pyrite crystals – Magnification 16 X*

Figure 5: *Group of pyrite crystals – Magnification 5 X*

Figure 6: *Aggregated pyrite crystals - Magnification 17 X*

All Photographs have been taken by the author. A larger collection of inclusions inside Colombian emeralds may be found in http://www.gemtec.com

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