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Geochemical Analysis for Sedimentary Emerald Mineralization in Western Emerald belt, Colombia

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Colombia hosts a large quantity of mineral resources due to its complex tectonic arrangement, and emerald deposits are one of the most representatives for the country. Emeralds in Colombia occur mainly in black shale, and are located in eastern Andes Cordillera with two parallel belts separated by approximately 130 Km: the Western belt (WB) and the Eastern belt (EB). The geological, mineralogical and tectonic features from these belts are quite similar (Buenaventura 2002).

Previous researchers concluded that emeralds in Colombia came from hydrothermal sedimentary processes without any magmatic influence, and suggested that the source of Cr, V and Be (which are important components of the beryl) was the host rock. According to their results, the process which allowed the shale to release these cations was the metasomatism (albitization and carbonization), which was resulted from the interaction between the rocks and the alkaline brines. Fractures and fault planes originated by these tectonic movements were fulfilled by enriched fluids, which they allowed emeralds and the other minerals precipitation with decreasing alkalinity and pressure (Giuliani et al. 1994). However, there were several pitfalls of conclusions drawn from previous researches. Firstly, Cr and V were widely distributed and come from mafic and ultramafic rocks, and Be was mostly found in pegmatites, finding these elements in sedimentary rocks suggest that probably the ultramafic rocks occurred not far from the deposits. Secondly, there was an inconsistency in the estimated temperatures of emeralds formation, i.e. temperature of hydrothermal sedimentary deposits was only $\sim$200° C, while laboratory analysis showed that the formation of emeralds was higher than 300° C. Therefore, there might still be an allocthonus influence on emerald formation that significantly increases the temperature. This research is going to contribute information in order to clarify these inconsistencies,

We have done the O and C isotopes in calcite and S isotope in pyrite and shale from different mines along the (WB) in order to determine the main fluid source of the mineralization. Selected samples will also be analyzed with EDS, RAMAN and ICP-MS methods to obtain the exact compositions of elements with extremely low concentrations in host rock, metazomatized host rock and mineralization (productive and not productive veins); the main purpose is to measure how strong were the fluid-rock interaction to leach elements out from the black shale. Thin sections from the altered shale and vein have been analyzed with the purpose of identify paragenesis and microstructures in the mineralization. Finally, we would like to gather the results from different sectors and compare it with the previous studies.