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EVALUATION OF EMERALD POTENTIAL OF MOZAMBICAN PEGMATITES USING LITHOGEOCHEMICAL METHODS.

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ABSTRACT

Emerald is a dark-green chromium-vanadium rich variety of beryl, $Be_3Al_2Si_6O_{18}$. The rarity of emerald arises from the combination of two elements (Be and Cr), which are normally mutually incompatible in geochemical terms. Emeralds are more rare and often more valuable than diamonds of the same size and quality. Emeralds are gems that hold their color well and are easier to work with than diamonds. For these reasons emeralds are among the most treasured of all gemstones and have been mined since ancient times in Egypt.

Present day annual production reaches 15 million carats, with Colombia being the largest producer, followed by Brazil and Zambia and, with substantially lower productions, by Russia, Madagascar, Mozambique, Zimbabwe, Pakistan and Afghanistan (Giuliani et al, 1998).

Emerald deposits can be subdivided into two different categories (Giuliani et al, 1997). The predominant deposit type is associated with pegmatites and granites (also known as glimmerite type) while the rare but probably the most valuable deposit type is associated with thrusts and shear-zones (also known as telethermal type).

The genetic model proposed for the pegmatite-granite (or glimmerite) type involves the intrusion of granitic pegmatites within Cr-V-bearing basic-ultrabasic rocks. In these deposits emerald, formed through metasomatic processes, occurs in phlogopite schists/phlogopitite (often called glimmerites) contained within serpentinites and talc-schists or in plagioclasites formed from the pegmatite. The metasomatic process involves the addition of elements characteristic of an acid granitic assemblage (Be, F, B, P, alkalis) to a typical ultrabasic assemblage, that becomes depleted in Mg, Ti, Cr, Ni and Cu. This process is illustrated in Figure 1, based on observations made at the Franqueira deposit, Galicia by Martin-Izard et al (1995). Examples of this type of deposits include the easternmost Brazilian deposits (Carnaiba, Socotó and Quadrilátero Ferrífero), the Urals deposits in Russia, the Khalataro district in Pakistan, the Alto Ligonha district in Mozambique, the Miku district in Zambia, the Sandawana district in Zimbabwe, the Morafeno district in Madagascar, the Franqueira deposit in Galicia/Spain and the Australian deposits.

The thrust and shear-zones (or telethermal) type deposit is not related to igneous activity and its origin is poorly understood. The emerald occurs in organic-rich black shales. It has been suggested that this deposit type might have formed from evaporatic brines that flow through structurally favorable sites were sulfate is thermochemically reduced and the sulfur releases Cr, V and Be from the shales (Ottaway et al, 1994). Examples of this type of deposit include the famous Colombian deposits of Muzo and Chivor, the Sta. Terezinha district of Brazil and the Swat Valley in Pakistan.

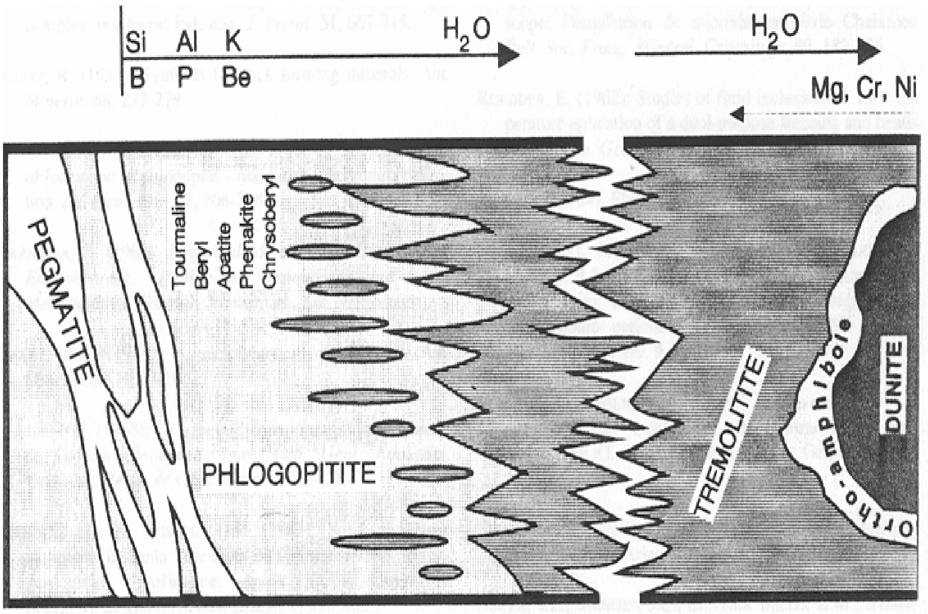

Figure 1-Schematic genetic model for pegmatite-granite type emerald deposits, developed for the Franqueira deposit, Galicia by Martin-Izard et al,1995.

Mozambique is renowned for its quality gemstones. Emerald occurs in pegmatites of the Alto Ligonha district (Zambézia Province), where it was mined at the Maria III and Niane deposits (Dias & Wilson, 2000). Production seems to be irregular, ranging from zero to 1145 kg, attained in 1994 (Mineral Resources Development and Investment Opportunities, 2003).

In all the occurences worked in the Alto Ligonha area the setting was in basic or ultrabasic bodies wich occur isolated from each other, with individual compositions. These seem to be remnants of larger bodies left behind by erosion.

REFERENCES

Dias-MB; Wilson-WE, 2000, The Alto Ligonha Pegmatites, Mozambique. Mineralogical Record; 31; p. 459-497.

Giuliani-G; Silva-LJHD; Couto-P, 1997, Origin of emerald deposits of Brazil. Mineralium Deposita, 25; p. 57-64.

Giuliani-G; France-Lanord-C; Coget-P; Schwarz-D; Cheilletz-Alain; Branquet-Y; Giard-D; Martin-Izard-A; Alexandrov-P; Piat-D-H, 1998, Oxygen isotope systematics of emerald; relevance for its origin and geological significance. Mineralium Deposita, 33; p. 513-519.

Mineral Resources Development and Investment Opportunities, 2003, Mozambican Ministry of Mineral Resources and Energy, Maputo, 53 p.

Martin Izard-A; Paniagua-A; Moreiras-D; Acevedo-RD; Pascual-CM, 1995, Metasomatism at a granitic pegmatite-dunite contact in Galicia; the Franqueira occurrence of chrysoberyl (alexandrite), emerald, and phenakite. Canadian Mineralogist; 33; p. 775-792

Ottaway-TL; Wicks-FJ; Bryndzia-LT; Kyser-TK; Spooner-ETC, 1994, Formation of the Muzo hydrothermal emerald deposit in Colombia. Nature (London). 369; p. 552-554.