Trace-element contents and cathodoluminescence of “trapiche” rubies from Mong Hsu, Myanmar (Burma): geological significance

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Summary
Mong Hsu rubies of the “trapiche” type are sporadically seen in the gem market. However, they have never been described in the field. The study of the nature of solid inclusions, the variation of trace-element contents, as well as the cathodoluminescence behaviour of six “trapiche” rubies permit the conclusion that these rubies crystallised in the same geological environment (marble-type deposit) as the normal rubies from Mong Hsu: (1) Cr and V are the main chromophorous elements in both ruby types; they act, together with Ti, as activators or quenchers for cathodoluminescence; (2) calcite, dolomite, rutile, mica, diaspore, apatite, chlorite, and feldspar are solid inclusions found in both ruby types; (3) the presence of bastnäsite in trapiche ruby and fluoride in non-trapiche ruby indicates the circulation of F-bearing fluids during ruby deposition; (4) the distribution of trace-element contents in the crystal is similar for both ruby types. In the Cr2O3 vs. Fe2O3 and Cr2O3 vs. Fe2O3/TiO2 diagrams, the population fields of Mong Hsu “trapiche” and non-“trapiche” rubies overlap. They are distinct from those of rubies and sapphires hosted in basalts from South-east Asia.

Introduction
Myanmar (Burma) ruby deposits are well known for their famous Mogok pigeon-blood rubies. In 1991, the Burmese rubies and pink sapphires coming from a new source, Mong Hsu mines, entered the gemstone trade (Tin Hlaing, 1991). The main
feature of non-heat-treated Mong Hsu rubies is their colour zoning with a violet to black core surrounded by a red rim, and also violet to blue colour bands developed along individual crystal faces (Smith and Surdez, 1994; Peretti et al., 1995, 1996). Tin Hlaing (1991) observed these rubies in-situ, in marble-hosted deposits, located approximately 250 km East of Mandalay and 250 km South-east of Mogok.

The Spanish term “trapiche” was used for the first time with respect to Colombian emeralds for their resemblance with the grooved millstone used by Pre-Colombians for sugar cane crushing (McKague, 1964). Mong Hsu “trapiche” rubies, which were never observed in primary deposits, are sold in Burmese and Thai markets. They are constituted by six ruby growth sectors separated by skeletal arms. It is the purpose of this paper to characterise the “trapiche” rubies by the nature of their solid inclusions, their trace element contents and their cathodoluminescence features, in order to compare their properties with non-“trapiche” rubies and to understand the geological origin of both rubies.

Fig. 1. Transmitted (a, c) light (parallel polars) and cold cathodoluminescence (b, d) photomicrographs of “trapiche” rubies. Cathodoluminescence images obtained on a Technocyn apparatus with ~15 kV voltage and ~450 mA beam current