Title : Gemological Characteristics, Chemical Compositions, and Cause of Color of Gemstone Trade Named Blue Dumortierite Quartz claimed to be from Brazil

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Major : Gemology

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ABSTRACT

"Blue Dumortierite Quartz" is a trade name for a gem variety of quartz (α-SiO_2) containing dumortierite mineral ($Al_7BO_3(SiO_4)_3O_3$) inclusions. It may also contain various trace elements, including Al, Fe, Ti, Mn, Mg, Na, and K. This study aimed to investigate the gemological characteristics, mineral inclusions, and chemical compositions of Blue Dumortierite Quartz claimed to be from Brazil. A total of 15 raw translucent to semi-translucent Blue Dumortierite Quartz samples were examined. Based on standard gemological testing, the samples ranged from 3.605 to 43.718 carats. Their specific gravity ranged from 2.62 to 2.65. All samples were doubly refractive and uniaxial positive, consistent with quartz (α-SiO_2), with refractive indices ranging from 1.544 to 1.553 and birefringence values between 0.007 and 0.010. All samples were inert under both short-wave and long-wave ultraviolet radiation. Under microscopic observation, dark blue acicular inclusions were observed, which were interpreted as dumortierite. Healed fractures and unhealed fractures were also present within the samples. Chemical compositions examined by X-ray fluorescence (XRF) point analyses showed average values of silicon dioxide (SiO_2) at 63.52 wt%, aluminium oxide (Al_2O_3) 35.12 wt%, titanium dioxide (TiO_2) 0.90 wt%, iron oxide (Fe_2O_3) 0.31 wt%, potassium oxide (K_2O) 0.16 wt%, manganese oxide (MnO) 0.01 wt%, and phosphorus pentoxide (P_2O_5) 0.0006 wt%. Boron could not be detected by this technique. In contrast, the host quartz areas showed average values of silicon dioxide (SiO_2) at 99.62 wt%, aluminium oxide (Al_2O_3) 0.33 wt%, titanium dioxide (TiO_2) 0.041 wt%, manganese oxide (MnO) 0.027 wt%, potassium oxide (K_2O) 0.020 wt%, and iron oxide (Fe_2O_3) 0.001 wt%. This

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result of high aluminium content in the analyzed dark blue acicular areas together with the microscopic observation indicated that the dark blue acicular minerals were likely to be dumortierite.

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