Mineralogy and Geochemistry of “Thoen Kaew Pong Kham” from Thoen District, Lampang Province

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ABSTRACT

Kaew Pong Kham is a trade name for a quartz gemstone in Thailand. It is the OTOP product of Mae Thot Sub-district, Thoen District, Lampang Province. The characteristics of Kaew Pong Kham were analyzed using 24 cabochon samples and 24 raw samples. The samples were collected from the Bo Pong Luang and Bo Mae Tern deposits, Mae Thot Sub-district, Thoen District, Lampang Province. Gemological properties–such as color, transparency, specific gravity (S.G.), refractive index (RI), and fluorescence–were analyzed using standard gemological tools. Minerals, textures, and inclusions were identified by polarizing and gemological microscopes. Geochemical composition was analyzed by X-ray fluorescence spectrometry (XRF). Based on mineralogical, gemological, and geochemical studies, the samples were classified into three groups. The crystalline quartz group consists of 34 samples. These samples have S.G. values ranging from 2.56 to 2.68. They are transparent to translucent and display colorless, colorless with inclusions (hematite, chlorite, and biotite), bluish-white to medium-dark gray, and moderate reddish-brown to pale yellowish-orange. The geochemical composition shows high SiO_2 (84-99%), low to moderate Fe_2O_3 (0.02–6.73%), and low CaO (0.06–1.48%). The microcrystalline quartz group includes 8 samples, with S.G. values between 2.41 and 2.61. These samples are translucent to opaque and range in color from moderate reddish-orange to dark yellowish-brown. Their geochemical character is high SiO_2 (88-98%), high Fe_2O_3 (0.19 – 7.55%), and low CaO (0.14 – 1.29%). The silicified rock and non-quartz group has 6 samples. This group contains black silicified pyroclastic rock with S.G. values of 2.44 – 2.61, high SiO_2 (89 – 94%), low Fe_2O_3 (1.24 – 1.46%), and moderate CaO (2.45%). It also includes light blue silicified tuff with S.G. of 2.61, high SiO_2 (92%), moderate Fe_2O_3 (2.93%), CaO (2.45%), and grayish purple fluorite with S.G. values of 3.03, low SiO_2 (5.59%) and Fe_2O_3 (1.32%), and high CaO (90%).

OBJECTIVE

- To study the mineralogical and gemological characteristics of minerals trade named as Thoen Pong Kham.
- To study the geochemical composition of minerals trade named as Thoen Pong Kham.
- To study the mineral diversity trade named as Thoen Pong Kham.

METHODOLOGY

Field study

Study of physical properties

Study of optical properties

Study of gemological properties

Study of mineralogical properties



Geochemical Analysis



Summarize and categorize into groups

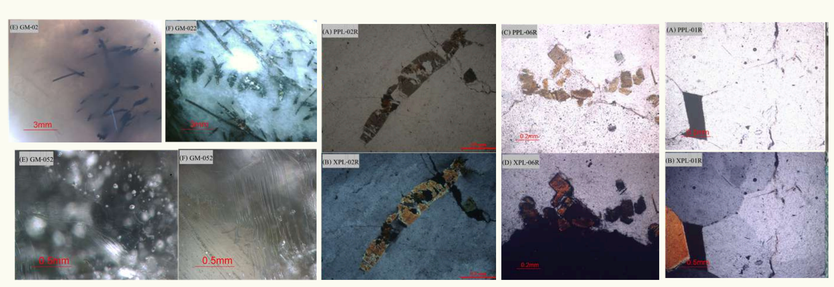
RESULT

Crystalline Quartz Group



Samples of crystalline quartz group

- Crystalline Quartz: 17 cabochon and 17 raw samples
- S.G. values ranging from 2.56 to 2.68
- Transparent to translucent
- Colorless, colorless with inclusions (hematite, chlorite, and biotite), bluish-white to medium-dark gray, and moderate reddish-brown to pale yellowish-orange
- The geochemical composition shows high SiO_2 (84-99%), low to moderate Fe_2O_3 (0.02–6.73%), and low CaO (0.06–1.48%)



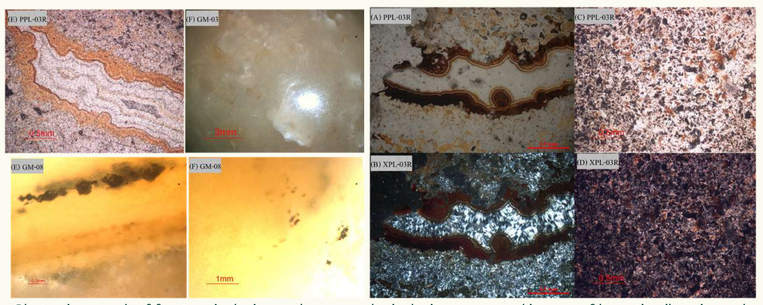
Photomicrograph of tourmaline, 2-phase, and feather inclusions under a gemological microscope, and photomicrograph of hematite and ilmenite under a polarizing microscope.

Microcrystalline Quartz Group



Samples of Microcrystalline Quartz Group

- Microcrystalline Quartz: 4 cabochon and 4 raw samples
- S.G. values between 2.41 and 2.61
- Translucent to opaque
- Moderate reddish-orange to dark yellowish-brown
- The geochemical character is high SiO_2 (88-98%), high Fe_2O_3 (0.19 – 7.55%), and low CaO (0.14 – 1.29%)

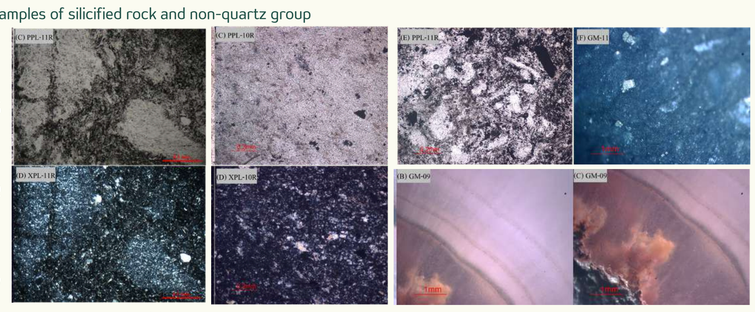


Photomicrograph of fracture inclusion under a gemological microscope and images of hematite, ilmenite and mineral veins composed of iron-titanium oxide minerals and quartz under a polarizing microscope.

Silicified Rock and Non-Quartz Group

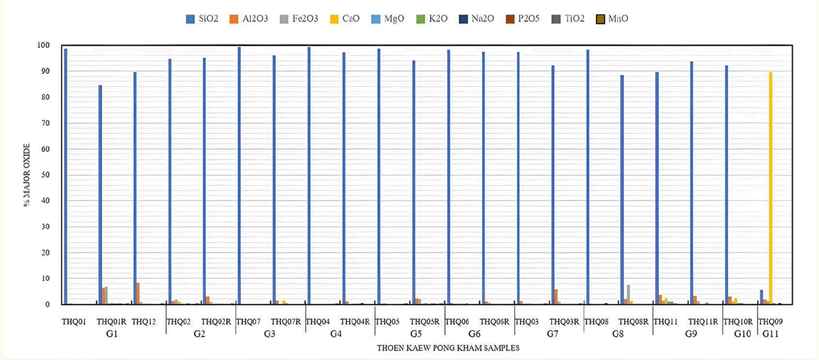


Samples of silicified rock and non-quartz group

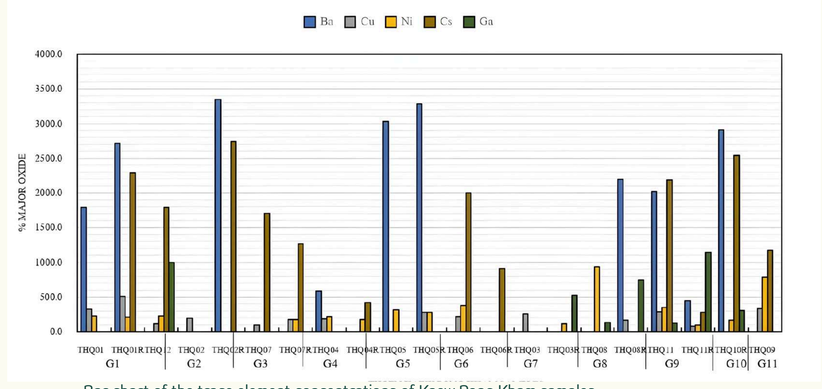


Photomicrograph of fracture inclusions observed under a gemological microscope, and images of hematite, ilmenite, and mineral veins composed of iron-titanium oxide minerals and quartz under a polarizing microscope.

- Silicified Rock and Non-Quartz: 3 cabochon and 3 raw samples
- Black silicified pyroclastic rock with S.G. values of 2.44 – 2.61, high SiO_2 (89 – 94%), low Fe_2O_3 (1.24 – 1.46%), and moderate CaO (2.45%)
- Light blue silicified tuff with S.G. of 2.61, high SiO_2 (92%), moderate Fe_2O_3 (2.93%), CaO (2.45%)
- Grayish purple fluorite with S.G. values of 3.03, low SiO_2 (5.59%) and Fe_2O_3 (1.32%), and high CaO (90%).



Bar chart of the major oxide compositions of Kaew Pong Kham samples.



Bar chart of the trace element concentrations of Kaew Pong Kham samples.

Conclusion

- Most samples are predominantly composed of quartz with various mineral inclusions, with minor silicified pyroclastic rock, and fluorite.
- Geochemical analysis indicates that SiO_2 is the dominant oxide component.
- The samples can be classified into three groups: crystalline quartz, microcrystalline quartz, and silicified rock and non-quartz minerals.

References

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Acknowledgement

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