

Nephrite Jade from Chuncheon, Korea

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Figure 1. Nephrite jade from Chuncheon city area, Korea. This rough nephrite is used to be gem on the jewelry and ornamental carvings.

Introduction

Jade has been the most favorite and noble ornamental stone in the traditional fashion and the aesthetic life in Korea since pre-historic time. It is now used for cabochons, rings, beads, bracelets, drop earrings and carvings. It can be carved into endless chains of super quality by Korean artists. Jade is a well-known term which is used widely to refer to a variety of colored stones, mainly white to green, and typically having a tough and compact texture. There are two kinds of jade: the

one is nephrite, a variety of amphibole and the other is jadeite, a pyroxene. Jade from Chuncheon city area, Korea, consists of nephrite and traded under the name 'Chuncheon Ock' (meaning Chuncheon jade) or 'Baek Ock' (meaning white jade) has been produced since 1976.

Occurrence

Nephrite is commonly found close to the geological boundary or contact between two or more distinctive rock types. There are two principal types of nephrite body. One type is associated with serpentinite, a magnesium-rich rock composed mainly of serpentine minerals. The second type is associated with dolomitic marbles. The recognition of these two types offers some possibilities for tracing nephrite jade sources (Ling et al. 2013), for nephrite derived from dolomitic marbles typically has a lower ratio of iron to magnesium.

The formation of gem-quality nephrite jade depends not only upon the formation of relatively pure deposits of tremolite-actinolite but also upon the texture of the rock. Geology of the Chuncheon nephrite mine area is composed of the age-unknown metasediments and later intrusive rocks. Chuncheon nephrite was formed by the overprint of metasomatic episodes occurring at the junctions between dolomitic marble and biotite schist (Kim 1995).

Genesis

The textures of nephrites and associated rocks show that the crystalline lime-silicate rock, the dolomitic rock, and the hornblende schist might be formed by metasomatism or metamorphism of pre-existing calcareous sediments before the formation of nephrite. Nephrite was formed from these rocks by thermal metamorphism, which might be related to the intrusion of granites just beneath the metasediments. The formation of Chuncheon nephrite from dolomite can be expressed by the reaction:



The formation of nephrite from diopside can be expressed as follow:



The formation of nephrite from coarse-grained tremolite is simply recrystallization (Kim et al. 1989).

Hardness

The hardness of the Chuncheon nephrite may be related to the state of aggregation of its cryptocrystalline grains. The hardness is measured at 6-6.5 on Mohs' scale.

Chemical composition

Nephrite jade typically includes two silicate minerals, tremolite $[\text{Ca}_2\text{Mg}_5\text{Si}_8\text{O}_{22}(\text{OH})_2]$ and actinolite $[\text{Ca}_2(\text{Mg,Fe})_5\text{Si}_8\text{O}_{22}(\text{OH})_2]$.

The major mineral of Chuncheon nephrite is tremolite, which is invariably very fine grained and mostly has a typical fibrous texture. Under a polarizing microscope, the pure nephrite is found to consist essentially of tremolite in the form of aggregates of minute fibres. Ling et al. reported that nephrite from Chuncheon only contains very fine grained tremolite of $6\mu\text{m}$ in length and $0.5\mu\text{m}$ in width. They also introduced that Chuncheon nephrite is characterized by a mosaic texture, which is more easily observed under reflected light.

Chuncheon nephrite shows about the same toughness and translucence, but has slightly different shades. It is greyish green, greenish grey, and greyish yellow green as determined carefully with the rock. Table 1 shows trace elements of a rough nephrite sample with light green grey. Tremolite of analyzed samples is rich in Mg and contains small amounts of Fe, Mn and trace Cr, Co, Ni, Cu, Zn (Table 1). The pale green shade of the samples is caused by FeO contents in tremolite.

Table 1. Contents of trace elements in Chuncheon nephrite with light greyish green (ppm)

	K-N1	K-N2	K-N3	K-N4	K-N5	K-N6	K-N7	K-N8
Fe	2774.46	3525.8	3479.05	3621.8	3446.52	3407.85	2861.88	2501.89
Mn	519.55	639.75	526.39	513.30	514.19	566.88	530.22	515.44
Co	0.56	0.52	0.62	0.88	0.70	0.71	0.64	0.76
Cr	2.23	1.65	<1.18	1.59	1.12	<1.92	1.34	1.54
Ni	<1.20	<1.33	1.31	<1.31	<1.25	2.13	<1.29	0.98
Cu	<0.24	<0.32	<0.26	0.24	0.28	0.50	0.30	0.21
Zn	43.55	43.02	41.14	40	39.96	41.01	40.01	39

Conclusion

The Korean Jade, a nephrite from Chuncheon, Korea, has been studied for mineralogical and gemological characterization. It consists of an aggregate of cryptocrystalline tremolite grains. Textural study shows that the cryptocrystalline tremolite might have been formed from pre-existing tremolite, diopside and dolomite by thermal metamorphism. The samples entirely consist of almost pure tremolite and its characteristic mosaic texture.



Reference

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