Jade

In gemmology, only two minerals are recognised as jade materials: ***nephrite*** and ***jadeite***. The physical properties of these minerals are as follows:

	Nephrite A member of isomorphous series of tremolite and actinolite of the amphibole group	***Jadeite*** Pyroxene group
Chemical Composition	Hydrous Magnesium-iron Calcium Silicate $Ca_2(Mg, Fe)_5Si_8O_{22}(OH)_2$	Sodium Aluminium Silicate $NaAl(SiO_3)_2$
Crystal System	Monoclinic	Monoclinic
Crystal Habit	Polycrystalline to cryptocrystalline. Interlocking masses of microscopic fibrous crystals	Polycrystalline to cryptocrystalline. Granular to fibrous interlocking structure
Hardness	6.5	Approx. 7
Specific Gravity	2.8 – 3.1	3.30 - 3.36
Cleavage	Perfect in 2 directions: 124^o and 56^o	Imperfect in 2 directions at 87^o and 93^o
Fracture	Uneven to splintery	Sugary, hacky
Colour	White to yellowish and reddish, dark green, black, also grey, brown	White, green, mauve, blue, orange, brown to black
Lustre	Greasy to vitreous	Greasy to vitreous
Refractive Index	1.62	1.65 - 1.67
Locality	China, New Zealand, Canada, Russia, USA	Upper Mymmar, Japan, California, Russia
Remark	Most precious jade material in ancient China	Not known to China before early Ching Dynasty
Jade Simulants	Translucent emerald, prehnite, chrysoprase (chalcedony), bowenite (serpentine), californite (idocrase), hydrgrossular garnet, aventurine quartz (Australian jade), dyed quartize, dyed marble, glass and plastics	

Terminology in modern jadeite trade:

A Jade : Natural jadeite without treatment; this class has nothing to do with quality i.e. colour and transparency.

B Jade : Dark impurities (such as iron oxides) corroded by strong acids and the material consolidated with resin.

C Jade : Dyed jadeite.

B + C Jade : Jadeite subject to the above two treatments.

Identification:

1. Jadeite vs nephrite

Method/ Instrument used	Remark
Observation	Generally speaking, nephrite is an aggregate of microscopic fibrous crystals; hence a weaker lustre than that of jadeite.
Hardness test	The Chinese name of jadeite is hard jade and nephrite is soft jade. In other words, jadeite can scratch nephrite; however, this destructive test is not applicable to jade jewel in terms of gemmology.
Hydrostatic weighing method	If the jewel is not set in ring or other matter/material, to test the SG is a convenient method.
Refractometer	Use refractometer to obtain the RI figures for comparison (please see the table)

2. B Jade

Observation	- B jade has a weaker lustre (waxy) than most types of natural jadeite but the green colour is sometimes too bright with that lustre. - Under magnification, the crystal edges are fuzzy because of the solution and destruction of individual grains after acid bath.
Infra-red spectrum	Infra-red spectroscopy can detect the existence of resin in the tested sample.
Fluorescence	The resin may exhibits bluish white fluorescence under long wave ultra-violet light.

3. C Jade

Observation	Under 10X lens, green colour is seen being concentrated at grain edges because the dye stuff occupies the space among individual crystal grains.
CCF	If the dye stuff is (most often) chromic oxide to give green colour, the C Jade appears red when being viewed under a Chalser Colour filter.
Absorption spectrum	The natural jadeite may have an absorption line at red region (existence of chromium, 640-650 nm) and blue-violet (existence of iron, 450 nm). The C Jade has a wider band at red.

4. Jade simulants

4.1 Jadeite is an aggregate. In the first step of identification, by observation or using polariscope (a pair of crossed polarizing filters) to check the stone whether it is a single crystal or an aggregate.

4.2 To test SG and, or, RI to determine the mineral type.

4.3 Plastic is warm in touch. Glass has bubbles or micro dendritic structure (devitrification). Chrysoprase is apple green in colour. Aventurine quartz is dotted with green spots of fuchsite (green mica). Serpentine has a waxy lustre. Dyed quartzite and marble are like C Jade where green colour is concentrated at grain edges and cracks; the latter is effervescent in dilute HCL.

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