



Contemporary Jadeite Testing

By Dominic Mok, MSc., FGA, FGAA, DGA
Principal of the Asian Gemological Institute and
Laboratory Limited, Hong Kong (AGIL)

Jadeite is a sodium aluminum silicate mineral which has a polycrystalline structure. The hardness is 6.5-7 on the Mohs' scale, the average specific gravity value is 3.33, and the refractive index is approximately 1.66. The various colours of Jadeite are caused by the presence of chromium, iron and/or manganese transitional elements.

The Hong Kong jewellery trader has classified the nature of Jadeite (also known as Fei Cui Jadeite Jade) into four types:

Type A: Natural jadeite that has not been subjected to any form of chemical treatment to alter the appearance and structure of the stone.

Type B: Jadeite that has been bleached by concentrated acid and alkaline solution, and then resin impregnated. It is first bleached to remove the undesired colour tint of yellow, brown and black, with the green colour remaining. The bleaching process will heavily damage the structure of the jadeite causing it to appear less transparent. It is therefore necessary to impregnate the bleached jadeite with colourless resin in order to increase its transparency.

Type C: Jadeite which has its colour improved by the dyeing process.

Type B+C: Jadeite that has been bleached by concentrated acid and alkaline solution, and impregnated with coloured resin.

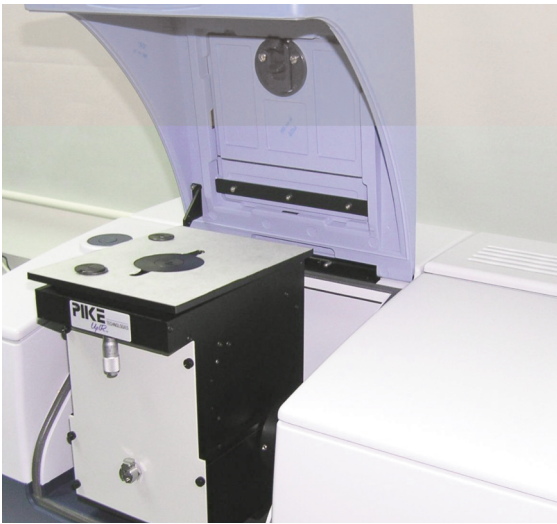


Colour collections of various jadeite.

The identification of green jadeite requires two major testing steps.

Use conventional and/or advanced instruments to test whether the stone is jadeite. Such instruments include electronic balance with SG attachment, polariscope, refractometer, infrared reflection spectrometer and Raman spectrometer.

The second test is for treatment and includes advanced equipment and professional conventional instruments such as FTIR (Fourier transform infrared spectrometer), UV-visible spectrometer, gemmological microscope, spectroscope, and ultraviolet lamp. These will help to determine whether the stone has been resin impregnated, dyed or composite.

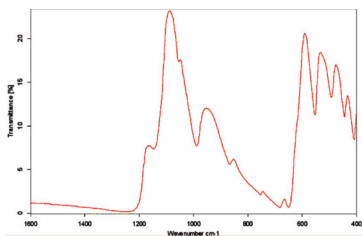


FTIR infrared spectrometer with reflection spectrum attachment.

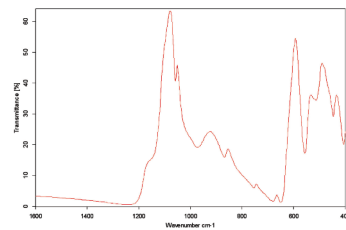


Large Jadeite carving being tested for infrared reflection spectrum.

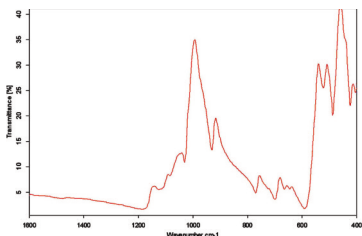
Examples of infrared reflection spectra:



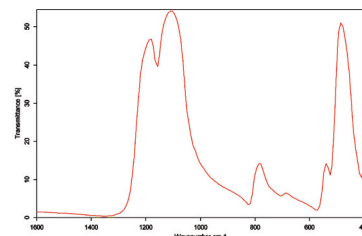
IR reflection spectrum of Jadeite.



IR reflection spectrum of GE synthetic jadeite.

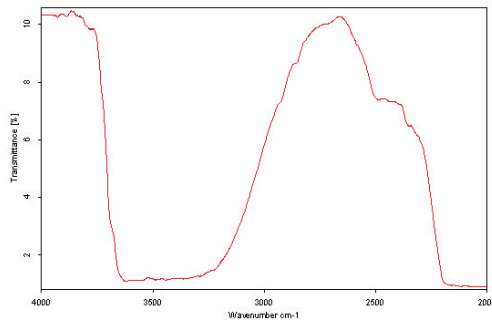


IR reflection spectrum of nephrite.

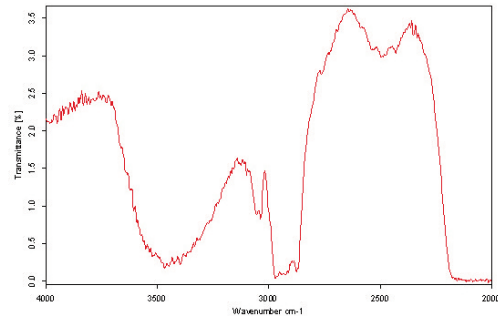


IR reflection spectrum of quartzite.

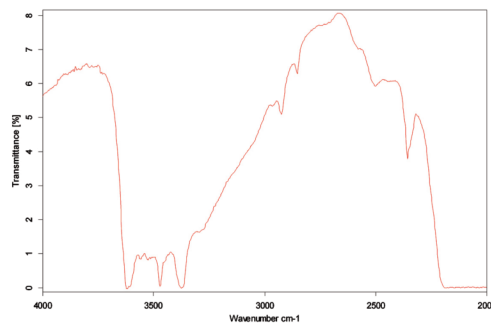
Examples of jadeite mid-infrared transmission spectra:



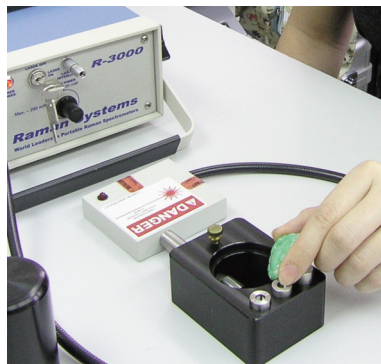
*No Resin
Type A: Natural jadeite*



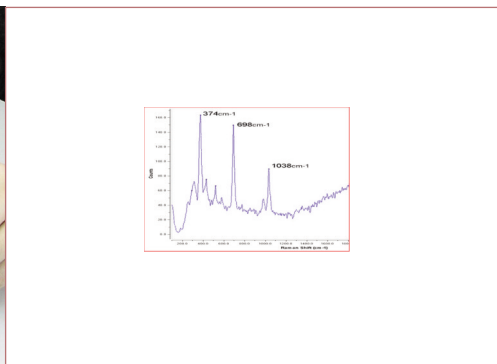
*Containing Resin
Type B: Resin impregnated jadeite*



*GE Synthetic Green Jadeite
Diagnostic spectrum: 3614 cm⁻¹, 3470 cm⁻¹, 3373cm⁻¹*



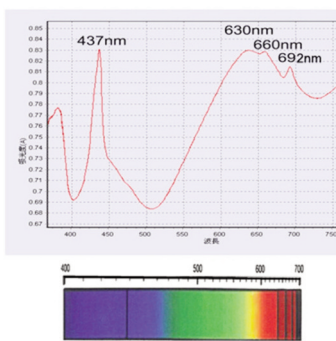
A portable Raman spectrometer.



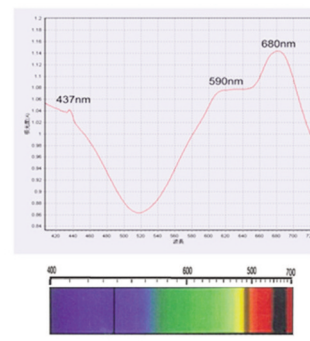
*The typical Raman spectrum of jadeite:
374 cm⁻¹, 698 cm⁻¹ and 1038 cm⁻¹*



The UV-visible spectrometer.



*Left top: UV-visible spectrum of natural green jadeite.
Left bottom: Absorption spectrum of natural green jadeite.*



*Right top: UV-visible spectrum of Type B+C jadeite.
Right bottom: Absorption spectrum of Type B+C jadeite.*

Summary

The overwhelming presence of treated jadeite in recent years has been a major worry for the jewellery industry. Modern treated jadeite closely resembles the appearance and some properties of natural jadeite. The Type B, Type C, and Type B+C jadeite may be mistaken for high value natural jadeite, making consumers more leery of buying jade.

Contemporary jadeite testing has developed into a stream of science. The gemmologist needs to analyse objectively by combining various testing data in order to identify the nature of jadeite accurately and objectively. Accurate scientific tests will safeguard consumers as well as the industry.

Gemworld International, Inc., 2640 Patriot Blvd, Suite 240, Glenview, IL 60026-8075, www.gemguide.com

© 2012 Gemworld International, Inc. All rights reserved.

All articles and photographs that appear are copyrighted by the author, the contributing person or company, or Gemworld International, Inc. and may not be reproduced in any printed or electronic format, posted on the internet, or distributed in any way without written permission. Address requests to the editor-in-chief. Abstracting of articles is permitted without prior approval when crediting the following at minimum. Gemworld International, The GemGuide, Gem Market News, Volume #, Issue #, Date.

The opinions expressed in this publication are the opinions of the individual authors only and should not necessarily be considered to be the opinions of the staff of Gemworld International, Inc. as a whole. Any website listings that appear in articles are for informational purposes only and should not be considered an endorsement of that company.