

Is Jadeite an Omphacite? Are they both Jade?

Did GIA and GAGB Figure it Out?

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The Gemmology Association of Great Britain (GAGB) picked up on the idea of a green mineral is jade if it comes from Burma and wrote this to promote kosmochlor as jade here in 1995:

https://gem-a.com/images/Documents/JoG/Archive/1956-97/JoG1995_24_5.pdf#page=5

The Gemological Institute of America (GIA) found when it used Raman spectroscopy, a modern method of mineral study, that some of its presumed jadeite jade specimens using antiquated technology such as Chelsea filters sent in for study were the mineral omphacite. That paper is online here in 2012:

<https://www.gia.edu/doc/omphacite-nomenclature-0521.pdf>

Later, the GAGB repeated its quest to name anything green, translucent and pretty to jade, such as kosmochlor and omphacite here in 2014, that expanded on its earlier pronouncement:

[A Comparative Study of Jadeite, Omphacite and Kosmochlor Jades from Myanmar, and Suggestions for a Practical Nomenclature](#), Leander Franz, Tay Thye Sun, Henry A. Hänni, Christian de Capitani, Theerapongs Thanasuthipitak and Wilawan Atichat, The Journal of Gemmology, 34(3), 2014, pp. 210–229, <http://dx.doi.org/10.15506/JoG.2014.34.3.210>.

Since GIA usage of 1860's tech as their standard for gem identification that includes hardness, streak, specific gravity, color, look, texture, and Chelsea filters cannot distinguish jadeite from omphacite, they decided to give up and call the omphacite mineral "omphacite jade" because apparently the Chinese like it and pay big money for it as jade. It is always a prerequisite to pander to the Chinese to do business with them.

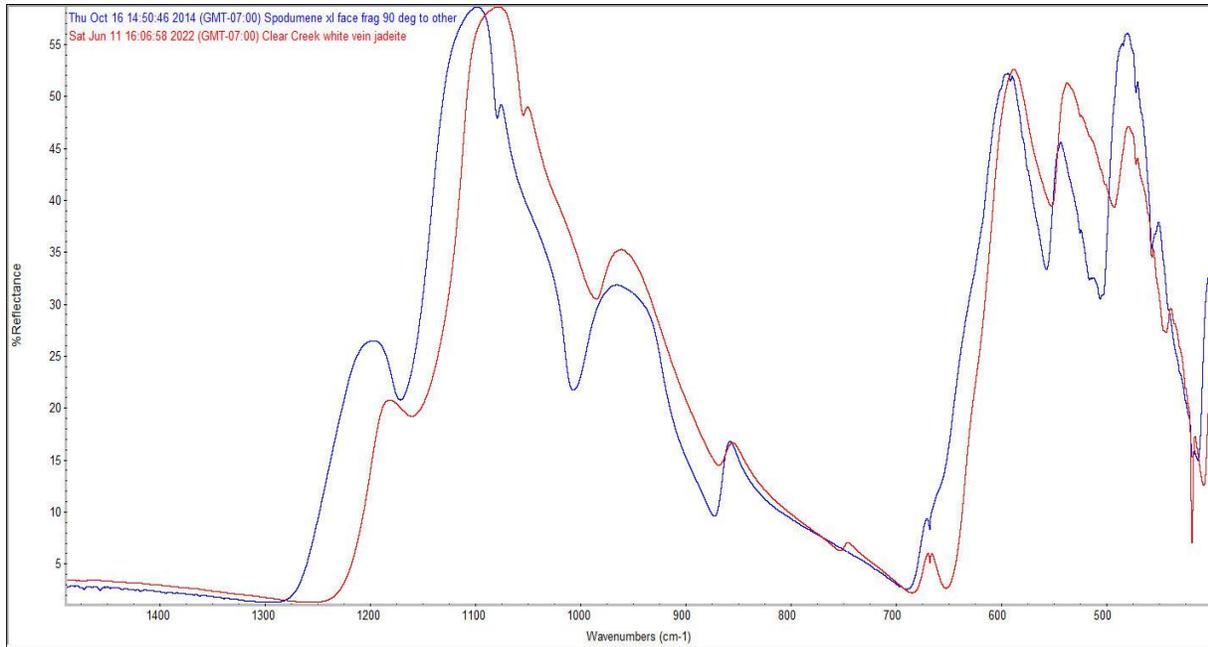
This has been adopted by others including some Chinese groups such as here in 2021:

<https://huangsjewelry.com/blogs/educational/difference-between-jadeite-omphacite-jade>

Now, if is the goal to call all green, translucent minerals jade, the author would complain that the extraordinarily beautiful mineral vesuvianite should be called "vesuvianite jade". Some diopsides are nice and translucent green, and mix with jadeite, and should be called "diopside jade". Why this has not occurred is not clear.

The research of the author focuses on reflectance infrared spectroscopy, a nondestructive infrared spectroscopy method. Along the way a number of discoveries have been made which allow better mineral identification. The key is that infrared spectra of crystals varies due to infrared energy response to a mineral lattice structure. This does not make infrared unreliable (and hence the GIA use of Raman spectroscopy, for example) but makes its spectra packed with more information that is currently understood in general science. For example, the spectra of spodumene ($\text{LiAlSi}_2\text{O}_6$) is identical to omphacite ($\text{NaFeAlSi}_2\text{O}_6$) with red-shift of omphacite since it is denser and has higher refractive index. We know their structures are identical because their spectra are identical as shown in Figure 1.

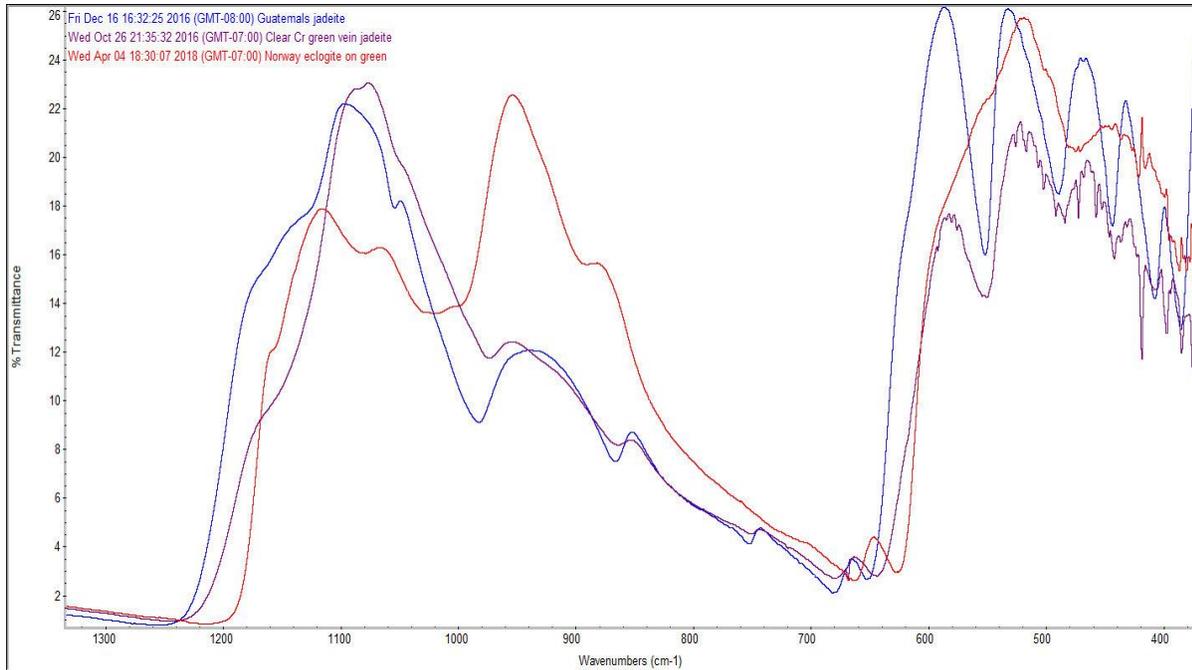
Figure 1. Spectra of Clear Creek, CA jadeite (red spectrum) versus spodumene (blue spectrum). Jadeite is red-shifted due to higher density hence higher refractive index max value, but since they are structurally the same, the peaks relative positions and shapes are the same. Infrared is reporting these two minerals have the same structure although they have different cations in their Si₂O₆ composition. Spodumene has lithium, while jadeite has sodium and iron, with Si₂O₆.



The key limit of current infrared literature understanding is the projection that all amorphous carbon compound response behaviors in infrared just apply to minerals that have lattice structure because notable people said so. This is not the case, and has led to a lot of misunderstanding of what infrared spectroscopy actually shows.

The author has acquired over time, jade candidate samples from around the world and particularly sites in the Western US, and has spent over a decade trying to figure out through confused literature what their infrared spectra actually show. This is done through theoretical understanding of infrared as well as a large sample population to study spectra variations. We have a lot of reference literature to compare to our samples. The infrared difference between jadeite, and omphacite is shown in Figure 2. Since they are not the same mineral, they should not get the same name, that is, "jade".

Figure 2. Reflectance infrared spectra. The red spectrum is omphacite in a Norway eclogite. It has a very tall and sharp 954 cm⁻¹ peak. A Guatemala jadeite (blue spectrum) has a 940 cm⁻¹ peak that is a roll, and a Clear Creek, CA jadeite (violet spectrum) has a minimal 955 cm⁻¹ peak, about the same intensity as others around it. Omphacite has two peaks at 600 cm⁻¹ to 400 cm⁻¹, while jadeite has 5. Eclogite omphacite has two dominant peaks at higher wavenumbers—1116 cm⁻¹ and 954 cm⁻¹, while the right peak of that pair is quashed in jadeite.



The case can be made that that a taller 960 cm⁻¹ region peak for jadeite represent some omphacite mix, but the jadeite peaks in specimens of the author stay relatively low and rounded, while tall peaks just under omphacite haven't been seen. This might be from under sampling, or it may actually be showing a compositional gap between them. More samples over the years may shed light on this. Because someone doodled out and published a ternary compositional diagram inferring a continuous series between jadeite and omphacite does not prove it actually occurs. Their diagram is an inference, not a proof based on data.

Conclusions:

1. Jadeite and omphacite are distinct minerals in infrared. A compositional series has not been proven.
2. Jadeite jade is comprised of jadeite.
3. Omphacite is not jade just like jadeite is not spodumene.
4. Kosmochlor the author has studied is comprised of clinocllore, which is not jade.
5. Anything translucent white to green out of Burma the Chinese pay a lot of money to buy is not jade unless you export green stones to China. Only jadeite is jade. Calling minerals jade because they cannot be identified with 1860's technology that previously confused them all together means that the technology should not be used for the identification of jade.
6. 1860's technology as described earlier does not competently identify minerals. No mineral as jadeite or nephrite can be identified by physical attributes accurately, and requires a method of spectroscopy—X-ray, Raman, or Infrared spectroscopy has to be used.