Is Illite a Variety of Muscovite?

Donald Kasper 10/16/2021

According to the web site mindat.org, illite is just a fine muscovite due to erosion, which makes illite a variety of muscovite. Given that specimens purchased online are typically misidentified and not even clay, and the bags of Portugal illite are broadly contaminated with calcite and other minerals, it has taken the author 12 years to get quality illite data using infrared spectroscopy.

Then, last week, a mineral dealer came by to get some stamps scanned in infrared for alleged coatings of willemite. The stamps have a slick clay coating. But what kind of clay? IR data shows that this clay is in the kaolinite group, but the water matches IR data published for illite. Its water bands are distinct from kaolinite. Kaolinite has a 4500 cm-1 region doublet but illite does not; it has just one sharp water band. The IR spectra show that this illite is mixed with calcite, apparently a typical occurrence.

IR spectra overlaying fundamental region and water region for muscovite and the illite candidate shows no water bands correlation, and some relationship in the fundamental peak region, with major differences. This means that kaolinite and illite may be derived from muscovite due to weathering, but take on clear differences.

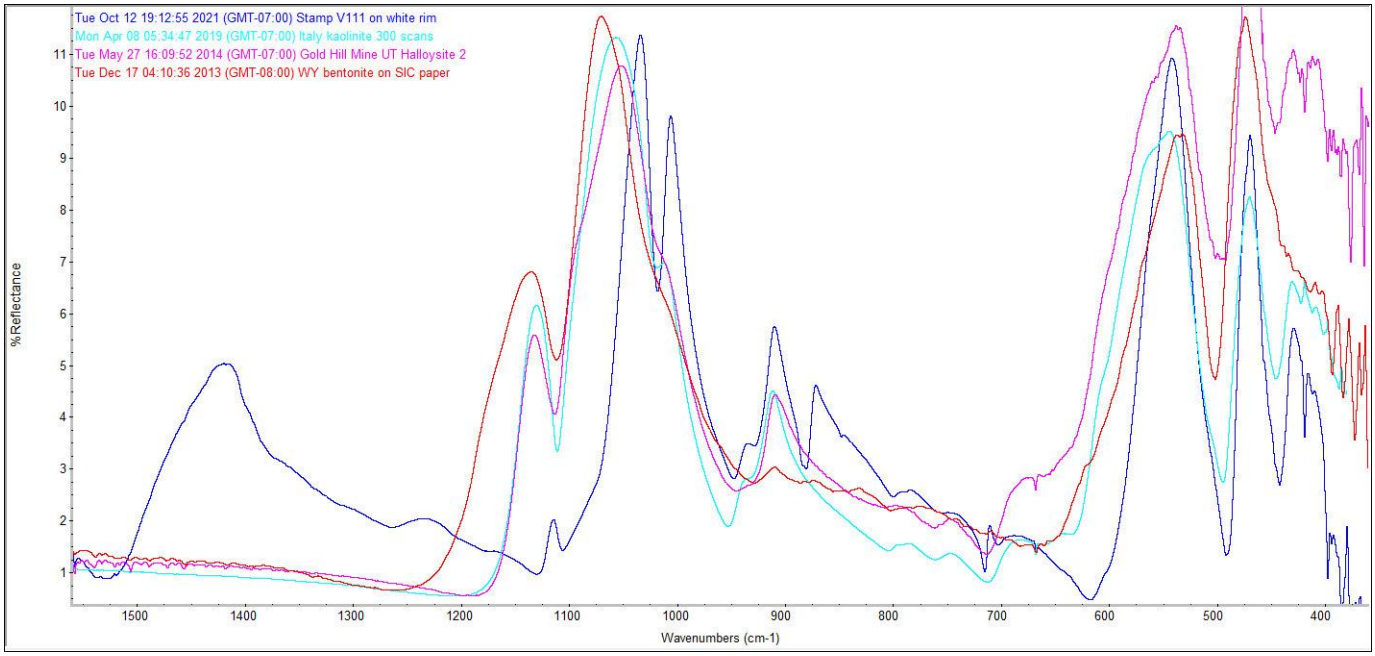
Conclusions:

The author sees that the kaolinite group actually comprises the following: kaolinite, dickite, nacrite, halloysite, and illite. Illite is not a slang term for weathered muscovite; it is a distinct kaolinite group mineral. From an infrared standpoint, illite is not muscovite. Illite forms from weathering with groundwater which seems to always introduces some hard water scale as calcite.

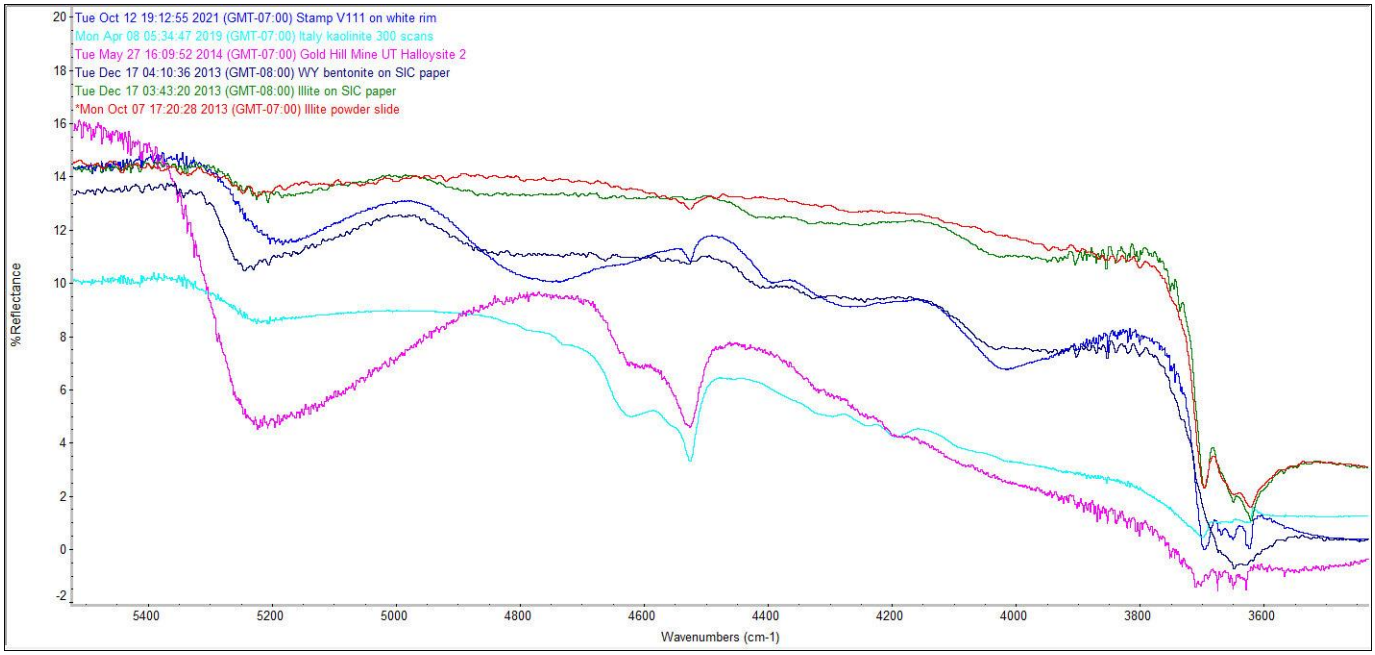
Data:

Spectra below comparing clay and muscovite references to stamp labelled V111 in the margin, coated in illite-calcite.

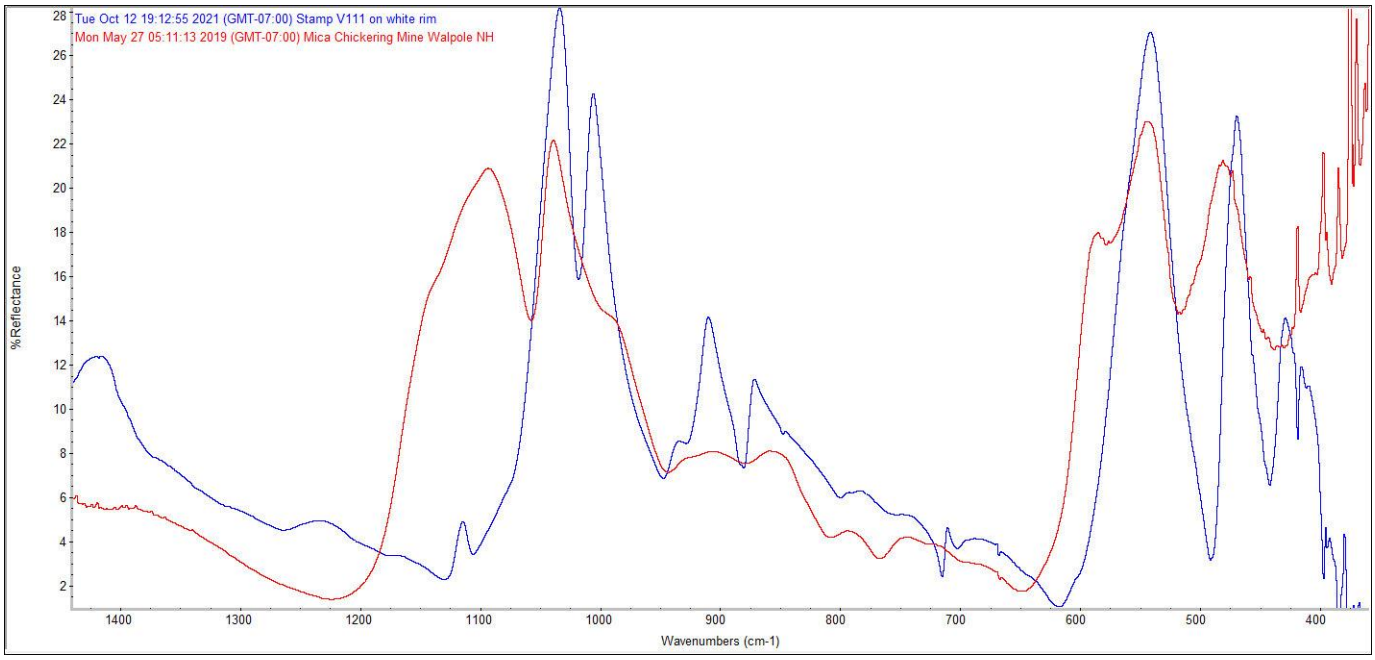
Clays fundamental region spectra. 1500-1200, 875 and 709 cm-1 peaks are calcite.



Clays water region comparison.



Illite candidate versus muscovite fundamental region comparison. Illite also has calcite peaks on the left through 1200 cm-1, and at 875 and 709 cm-1.



Illite versus muscovite water region comparison. The illite water rolls in the center at 4300-3500 cm-1 are calcite.