Application Note

170-NF-0208

Near Field IR Spectrometer and Microscopic IR Spectrometer

<Introduction>

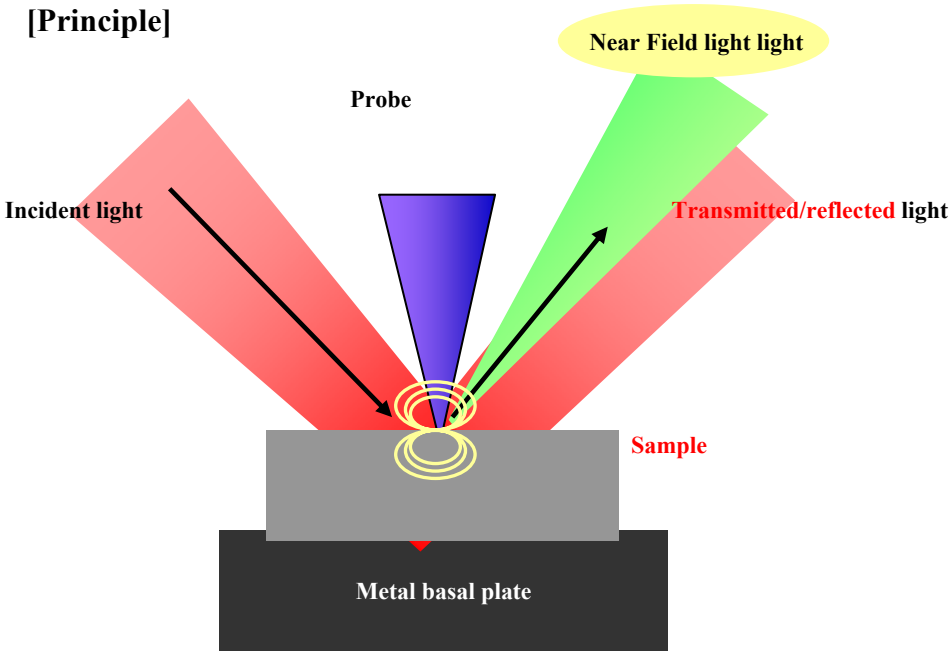
The natural materials such as rock consist of mineral substances, and more than 2000 kinds of the mineral substances are said to be existing in the world. Gem is one of the mineral substances, which is considered to be valuable due to its beauty, durability and rarity. Generally, for the analysis of such gem, non-destructive method is the basic approach to be followed.

This time we would like to report here below the measurement results of 40 kinds of standard gem substances by using both NFIR and Microscopic IR to obtain spectra of surface reflectance and to show that those two kinds of spectra obtained by NFIR and Microscopic IR are very well consistent.

<Experimental>

40 kinds of gem substances supplied by Tokyo Science Corporation were used as standard samples. Principle and measurement conditions for each instrument are shown below. NFIR spectrum of the gem surface was obtained by using the probe with its diameter of 1 μm, and the reflectance spectrum by Microscopic IR is obtained by measuring the area of 50x50 mm. The size of the sample gem at this time was about 10 x 10 x 5 mm. The excitation light and incident light were both reflected at the sample surface because the surface was finely polished so that those lights would not penetrate into the sample inside, and so the reflected light was measured.

[Principle]



NFIR-200 Near Field IR Spectrometer

<Measurement condition>

Dispersive Near Field measurement system NFIR-200
Probe diameter : 1 μm
Resolution : 8 cm^{-1}
Accumulation : 300 times

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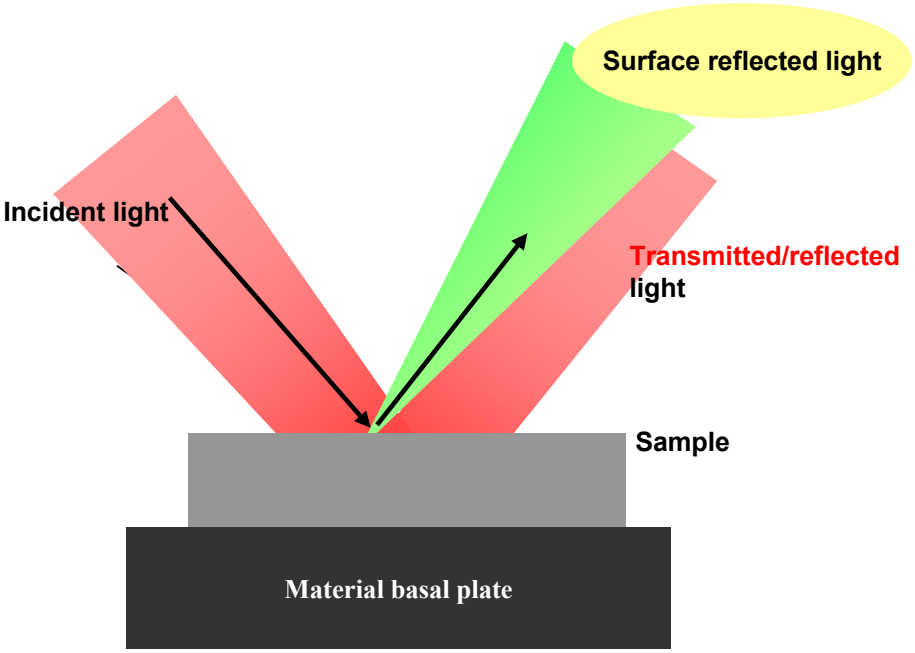

IRT-5000 Micro IR spectrometer

<Measurement condition>
Micro IR measurement system IRT-5000 & FTIR-4100
Measurement area : 50 x 50 μm
Resolution: 4 cm^{-1}
Accumulation : 128 times

<Measurement result>
Measured spectrum of each mineral substance is shown as below; Near field IR spectrum on the left side, and the reflectance spectrum by Microscopic IR on the right side. By comparing the spectra on both sides, it is confirmed that the peak position and the intensity ratio are very well consistent.

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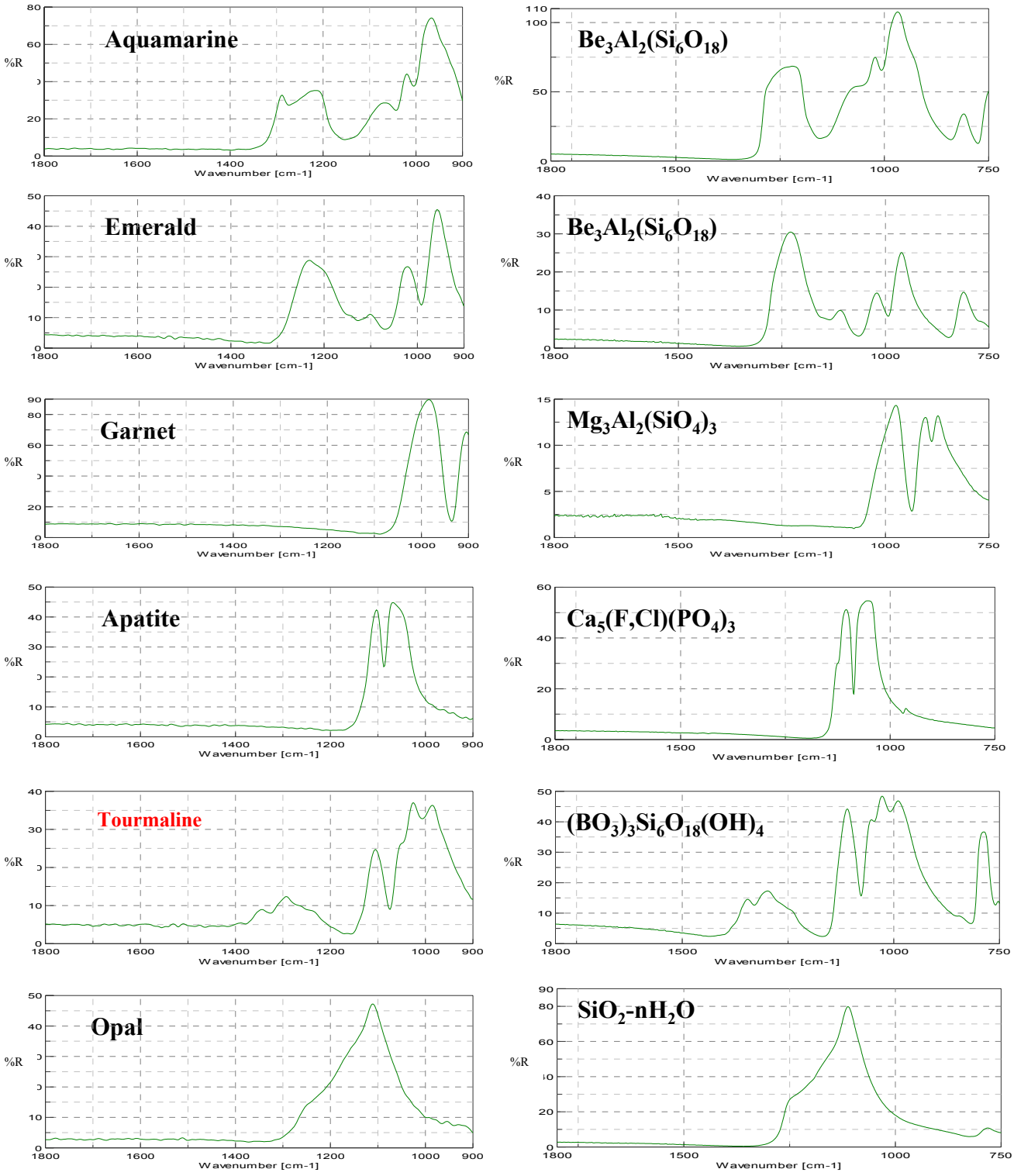
NFIR-200	IRT-5000
Aquamarine	$Be_3Al_2(Si_6O_{18})$
Emerald	$Be_3Al_2(Si_6O_{18})$
Garnet	$Mg_3Al_2(SiO_4)_3$
Apatite	$Ca_5(F,Cl)(PO_4)_3$
Tourmaline	$(BO_3)_3Si_6O_{18}(OH)_4$
Opal	SiO_2-nH_2O



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