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# Transparency experiment

Objective: To determine the transparency, T, against wavelength, λ, of the window which is to be used for the ANIR (Atacama Near-InfraRed camera) of the TAO project and to evaluate whether it is possible to use this window for the camera.

Introduction: In this experiment, we will use a transparency spectrometer called "UV-3100PC". Using this machine, we are able determine the transparency of the testing material with the wavelength of the spectrum as an independent variable. For this experiment we will measure the transparency between 0.6μm and 3.0μm. This machine works by shining equal light through the two holes of the spectrometer, one through the testing material and the other without any. The latter one is considered as 100% transparency and, with respect to this one, we measure the intensity of light through the testing material.

The window which is to be tested is a material called "Fused Silica $H_2O$ free". We are using this "$H_2O$ free" material for infrared is slightly absorbed by $H_2O$ which will interfere with the camera.

Apparatus: "UV-3100PC", "Fused Silica $H_2O$ free" window and a computer.

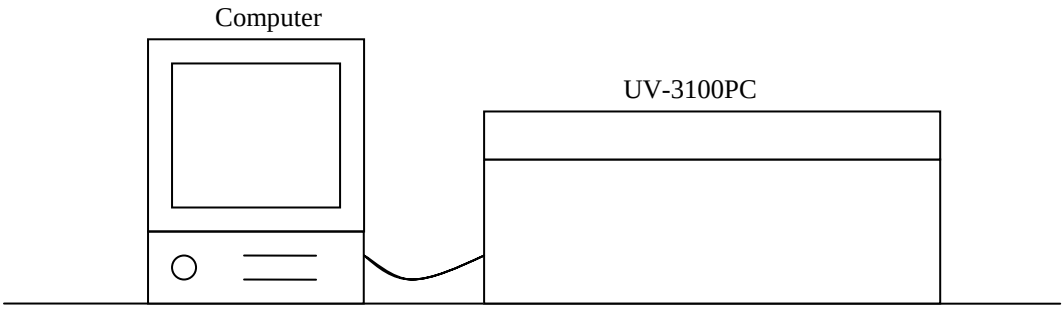
Procedure:

1) The "UV-3100PC" was sat up with the computer.
2) The "Fused Silica $H_2O$ free" was placed into the spectrometer.
3) The transparency of the material was measured against wavelength.
4) The graph was plotted on the computer.

Precautions:

1) Outside light must not enter the "UV-3100PC" during experiment: it must be sealed.
2) Have to be careful not to scratch the window.

Diagram:



Result:

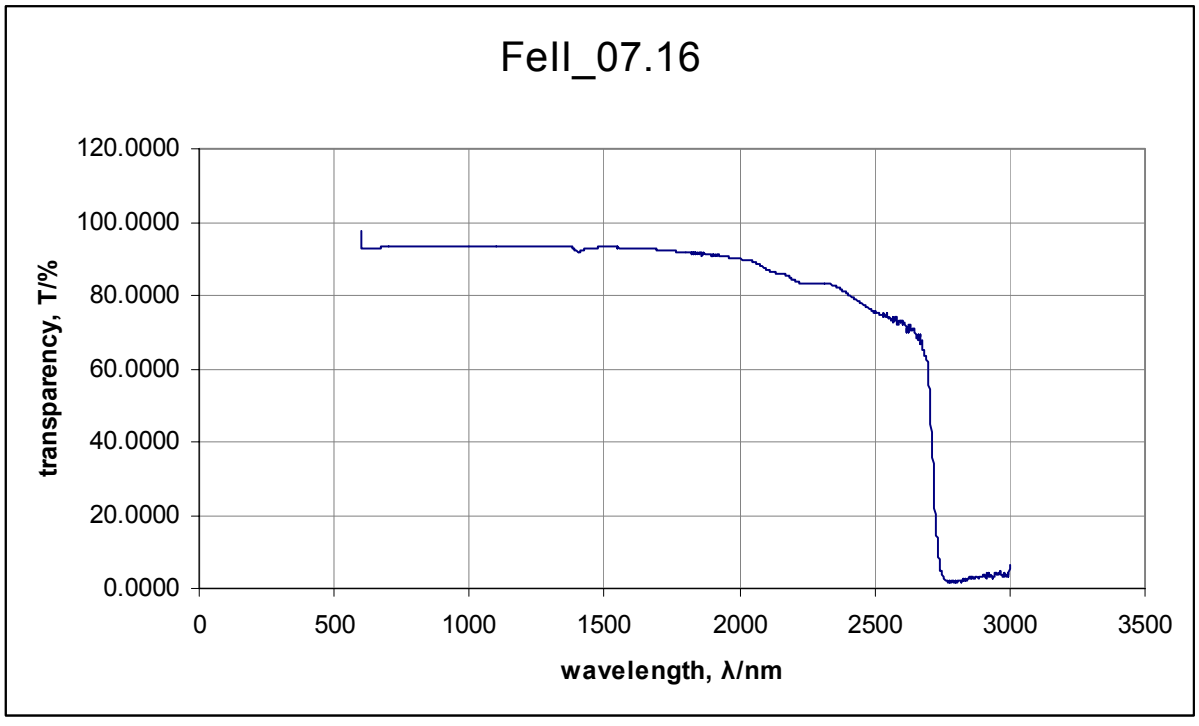
Data:

| Wavelength, λ/nm | Transparency, T/% |
|---|---|
| 3000 | 6.2650 |
| 2950 | 4.1210 |
| 2900 | 3.5770 |
| 2850 | 2.4230 |
| 2800 | 1.8950 |
| 2750 | 3.6190 |
| 2700 | 56.3700 |
| 2650 | 69.8800 |
| 2600 | 72.8700 |
| 2550 | 73.7800 |
| 2500 | 75.4500 |
| 2450 | 77.8200 |
| 2400 | 80.3300 |
| 2350 | 82.6900 |
| 2300 | 83.4100 |
| 2250 | 83.2600 |

| Wavelength, λ/nm | Transparency, T/% |
|---|---|
| 2200 | 84.1900 |
| 2150 | 86.0300 |
| 2100 | 87.1600 |
| 2050 | 89.2300 |
| 2000 | 89.9100 |
| 1950 | 90.5000 |
| 1900 | 90.9100 |
| 1850 | 91.4300 |
| 1800 | 91.7600 |
| 1750 | 92.1400 |
| 1700 | 92.5100 |
| 1650 | 92.7300 |
| 1600 | 92.9400 |
| 1550 | 93.0700 |
| 1500 | 93.1200 |
| 1450 | 92.9200 |

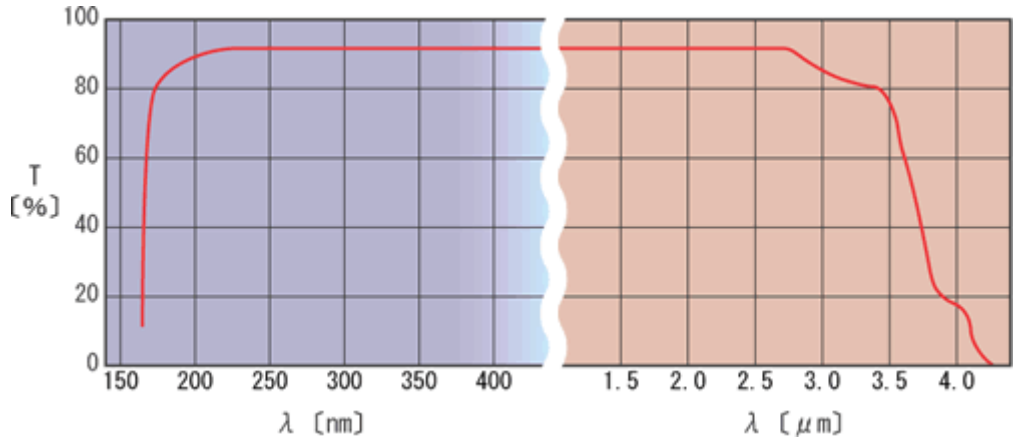
| Wavelength, λ/nm | Transparency, T/% |
|---|---|
| 1400 | 91.9100 |
| 1350 | 93.3800 |
| 1300 | 93.4200 |
| 1250 | 93.4800 |
| 1200 | 93.5300 |
| 1150 | 93.4800 |
| 1100 | 93.4500 |
| 1050 | 93.5100 |
| 1000 | 93.4700 |
| 950 | 93.3500 |
| 900 | 93.2800 |
| 850 | 93.3200 |
| 800 | 93.5200 |
| 750 | 93.3200 |
| 700 | 93.1800 |
| 650 | 92.9200 |
| 600 | 97.3400 |

Graph:

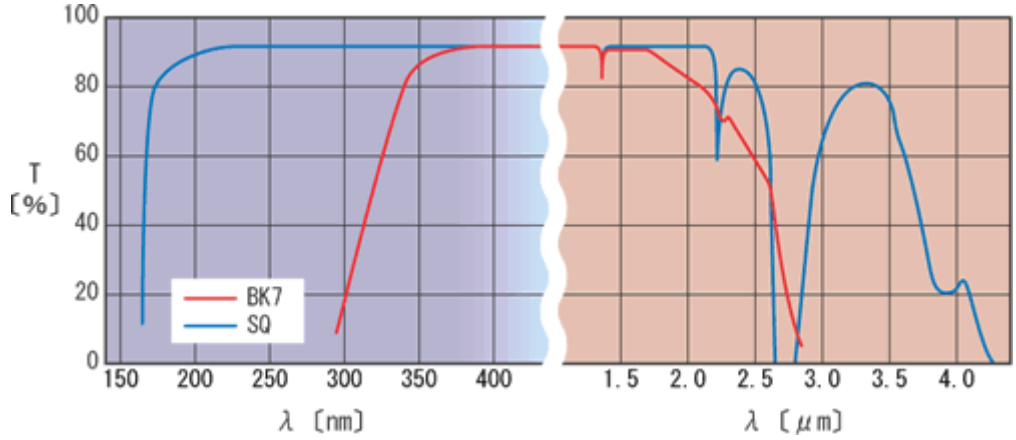


Analysis:

Using a reference source, our obtained graph should have looked like this if it was $H_2O$ free Fused Silica:




However as we can clearly see, it does not look like this graph but more like the graph of a BK7.




Source: http://www.sigma-koki.com/catalog/catalog_b.html#Windows

Conclusion: I believe that we can clearly say from this experiment that the window was not a "Fused Silica $H_2O$ free" but actually a BK7 which is a common crown glass that contains $H_2O$ which, therefore, can not be used for the ANIR.