Reflectivity Tests of Aged Ambrite from First OCLI Production Run

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Five Ambrite samples from the August, 1992 production run by OCLI were aged at 95 degrees C for 10 years equivalent and then measured for reflectivity along with adjacent unaged samples using both a Perkin-Elmer Lambda II (PE) and Beckman spectrophotometers. The purpose of these tests is to determine the appropriateness of the coating quality. Although these tests are preliminary, they show the difficulty in using the PE for thin samples that are easily bent. When possible, this problem is overcome by using the Beckman with an integrating sphere.

So as to compare with reflectivity measurements conducted at 0 degrees incidence by Gary Smith at OCLI, the reflectivity was measured at 15 degrees in air using the PE (15 degrees is the smallest angle available on this machine). The ratio of aged to new are shown in GRAPH 5 for the wavelength range of 200 to 800 nm. Typical variation is approximately within a 15% range above 350 nm and 25% below.

Graph 6 shows the reflectivity measured on the PE in water at 60 degrees, the average incident angle of cherenkov light in the detector. Above 450 nm the variation range for all samples except #494 107 is estimated to be typically within 2%. Below 450 nm the variation becomes quite large. Sample #494 107 was slightly bent causing an erroneous reading of the specular reflectance in the PE. This was corrected by measuring the specular-plus-diffuse reflectivity using an integrating sphere on the Beckman (in air). The ratio of aged to new is shown in GRAPH 7 with #494 107 being very close to the other sample values. It is thus inferred that this sample's reflectivity is comparable to that of the other samples. The increased variation below 450 nm is believed to be due to the slight difference in coating thickness from sample to sample resulting in different locations of the interference dip.

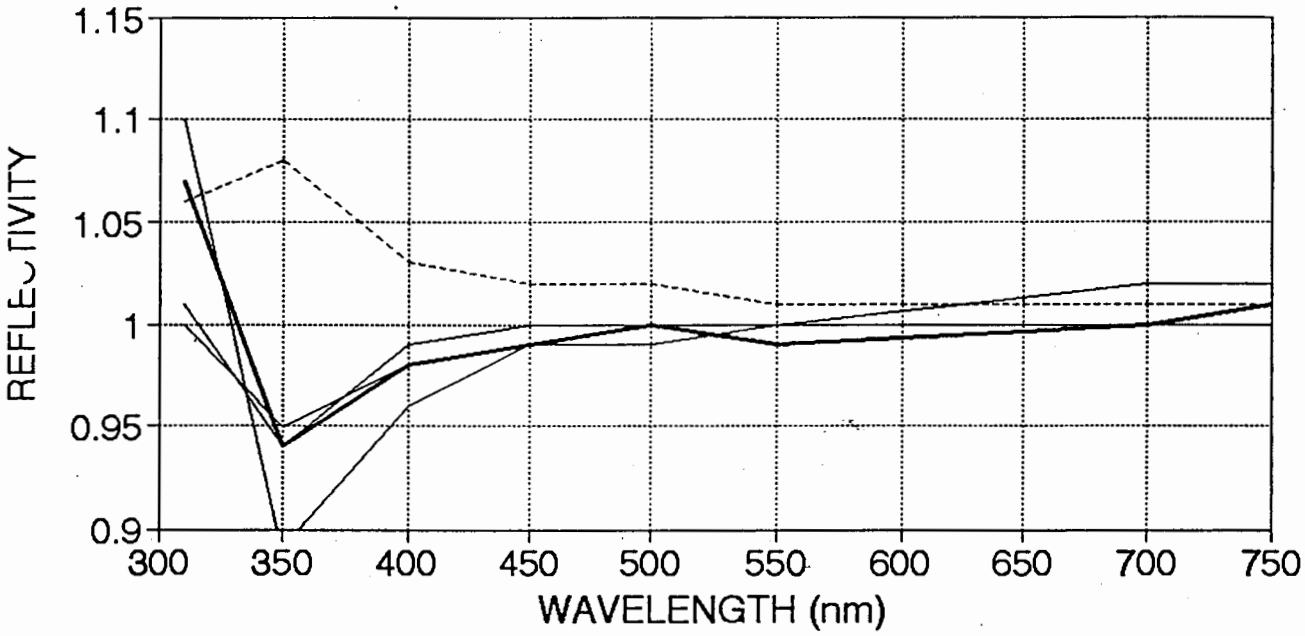
It should be noted that these results are 'worst-case'. The aging was conducted in very small bottles of water with *final* conductivities measured on the order of 10 microSiemens/cm. This is very high, indicating that extremely poor water quality (corrosiveness) was present. It is of further interest to note that the surface of the black ABS holders used to support the samples had turned grey. This is only a surface effect since scratching the surface reveals the original black colour below. A reasonable conclusion is that some of the pigment leached out, adding to the possible corrosive elements in the water. The high temperature is believed to be responsible for this effect, but these conditions are not expected in the detector.

A more realistic aging test is currently being conducted at the lower temperature of 65 degrees and using a large volume of water. The lower temperature should reduce the leaching rate and the larger volume of water should reduce the the corrosive effects of leached elements.

To more accurately simulate the environment of the detector, the flow of water over the surface of the Ambrite has been incorporated into the test. The flow rate in SNO has been calculated to be approximately 1cm/hr. This rate is achieved in the test by slowly rotating the samples at the appropriate rate. Attached is a schematic diagram of the equipment used for these tests.

OCLI PRODUCTION RUN, GRAPH 7

INTEGRATING SPHERE, AGED/NEW



S# 62 14
S# 269 67
S# 494 107
S# 620 169
S# 234 806

Rotating Ambrite Aging Apparatus