Gel transmittance measurements

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June 2019

1 Intoduction

Special kinds of gels are projected to be used between acrylic cover and photosensor in SuperKamiokande detector(They are currently used in prototype detector). Total detection efficiency of the detector is directly related to the transparency of gel for the light produced inside the water. Then, measurement of transmittance of gel before using it inside the photomultitube is important . The goal is to investigate how the different kinds of gels are transparent to the special range of visible light.Then, one can estimate the transparency of gel for the Cherenkov light in inner detector of Superkamiokande. The second important aim is comparing the transparency of baked and unbaked gels to see what kinds of gels are suitable to be used in photomultitube(PMT). There are two different gels used for these measurements: 604 and 612 Silgels. In this report, the results of gel transmittance measurement for baked and unbaked gels of types 604 and 612 are illustrated.

2 Measurements and Results

Figure 1 shows the transmittance measurement for baked (The gel was kept for a month inside the oven) and unbaked gel of type 612 by 60:40 mixture ratio.Since during the measurement the spectrometer was not calibrated, the data are normalized to the 100% transmittance of gel for wavelength of 600 nm.

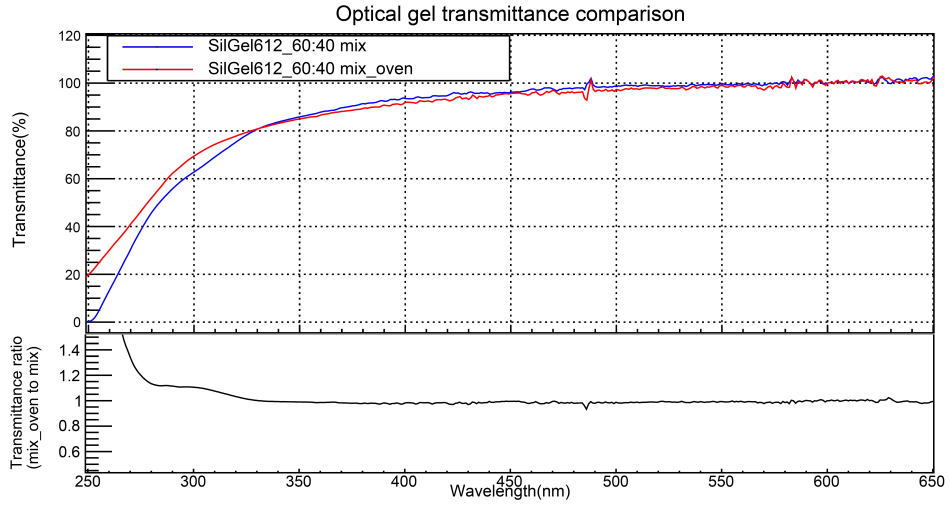

Figure 1: Comparison of transmittance for baked and unbaked gels of type 612,60:40.

As seen, for the wavelengths between 250 nm and 350 nm, the transmittance of baked gel is much higher than that of unbaked gel. For 350 nm to 650 nm wavelength range, however, the transmittance of two baked and unbaked gels are roughly same.

Figure 2 compares the transmittance efficiency for baked and unbaked gels of type 604 by 95:05 mixture ratio. Measurements show for the wavelength range of 250-450 nm, the baked gel is more transparent than unbaked one. For the rest of wavelengths up to 650, the difference of transmittance between two types of gels is negligible. A glance at figures 1 and 2 reveals that the transmittance of baked gel 604(95:05 mixture)is higher than that of 612(60:40 mixture). For the gels measured in this experiment the transmittance of gels for visible photon around 400 nm is between 90 and 98 percent.

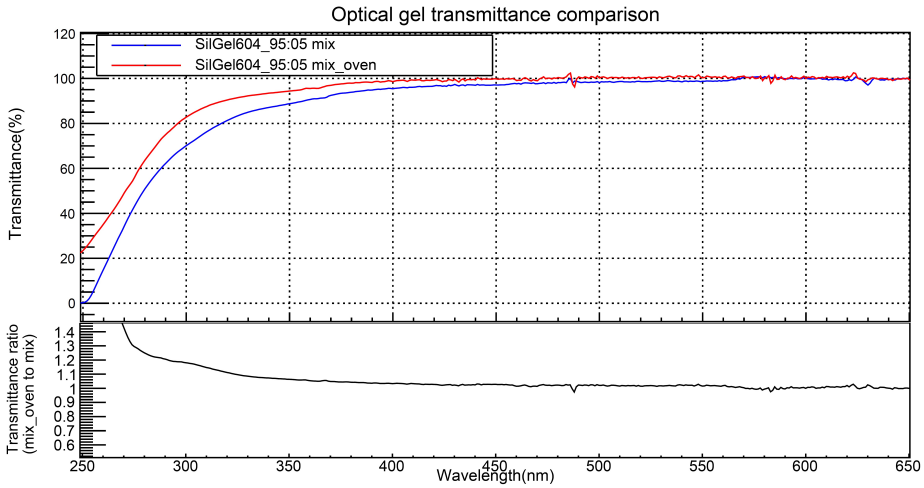

Figure 2: Comparison of transmittance for baked and unbaked gels of type 604, 95:05.

3 Conclusion and Outlook

Among the four different kinds of gels used in this experiment including,unbaked 612(60:40 mixture), baked 612(60:40 mixture), unbaked 604(95:05 mixture) and baked604(95:05 mixture) ,the last type has the highest transmittance for the wavelengths 250-550 nm. As a follow-up on this experiment, the same measurements can be done for different thicknesses of various kinds of gels in order to see the effect of thickness on the efficiency of transmittance.Preparing a thickness of gels in the scale of that of used in prototype photomultitube can make the measurements more meaningful.The measurement also can be done for acrylic cover samples, so that one can consider the total transmittance associated with two layers(acrylic cover and gel). As mentioned above, the data taken for transmittance measurements are normalized to 100% at wavelength of 600 nm;then, to avoid unreliable normalization, the calibration of spectrometer is recommended. This calibration can be done every year using certain check samples.