

First Production Run of Dielectric-Coated Aluminum Sheets for PMT Light Concentrators

Chris Waltham and Salvador Gil

University of British Columbia

September 1, 1992

SNO-STR-92-063

Introduction

The purchase order issued by the Oxford Nuclear Physics Lab on July 1, 1992, called on the Optical Coating Laboratory, Inc. (OCLI) to produce the following:

A total of 1750 sheets of 1000mm × 750mm × 0.3mm thick aluminum, supplied by Oxford via Amalco, coated on both sides as per the technical specification (given in part below). Of these, 820 were to be produced within 12 weeks of the order being issued. It is the production of these 820 sheets that we report here.

Technical Specification

Of crucial interest during the production were the optical specifications:

1. Total photopic reflectance, as measured on a Diano TR-2, greater than 93%.
2. Total specular reflectance, as measured on a Lambda-9, greater than 80% at 380nm.
3. The same as (2) but greater than 84% at 700nm.

In addition to the above, and to remove some of the normalization difficulties inherent in (2) and (3), we aimed to keep the wavelength at which the specular reflectance crossed the 85% point between 340 and 400nm.

Additional tests:

1. Visual inspection (for scratches etc.).
2. Nitto tape test (for adhesion of film).
3. Rub test.

The Run

92/08/27, 08:00

Inspection of the aluminum sheets delivered from Amalco revealed the following:

1. The sheets had NOT been flattened, in contravention of normal practice. This meant that the sheets sagged inside the frames and developed scratches passing through the coater.

2. No plastic sheets had been used as spacers, also in contravention of normal practice. Some small damage was evident in the centre of some sheets.

The entire order had been delivered already. It was decided to proceed as the difficulties of doing otherwise seemed large compared to the present problems.

After several trials the sheets were mounted on top of the frames, instead of being slung on the bottom. This gave us an extra half inch of clearance and avoided scratching during coating. As a result, a quarter-inch line along the sides of the sheet was shadowed and not coated. Worries that adhesion may be bad at some distance from this line due to local geometrical effects proved groundless: the tape test showed no such problem.

92/08/27, 13:00

Thirty frames were made up according to the new mounting method.

92/08/27, 15:30

First production of first side.

92/08/28, 01:30-10:30

Production of second side.

Conclusion

Apart from problems caused by the initial state of the sheets, the coating run proceeded very smoothly. We were impressed by the professionalism of the engineer in charge, Gary Smith, and the crew he had assembled to do the job. We now await results of aging tests and initial concentrator production in Oxford. The second and final run is expected to take place in the last week of October.

Figures

1. Distribution of total photopic reflectance as a function of part number.
2. Distribution of specular reflectance at 380nm as a function of part number.
3. Distribution of specular reflectance at 700nm as a function of part number.
4. Distribution of 85% crossing point as a function of part number.

Figure 1

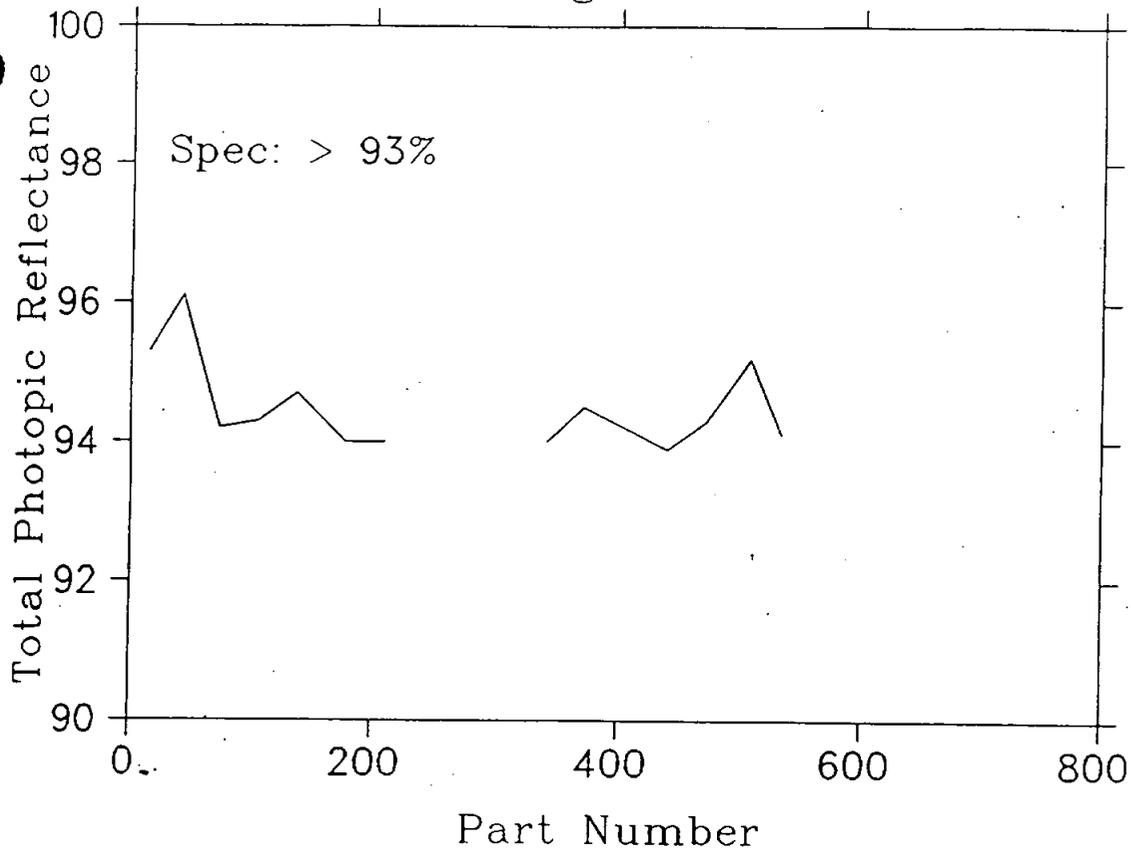


Figure 2

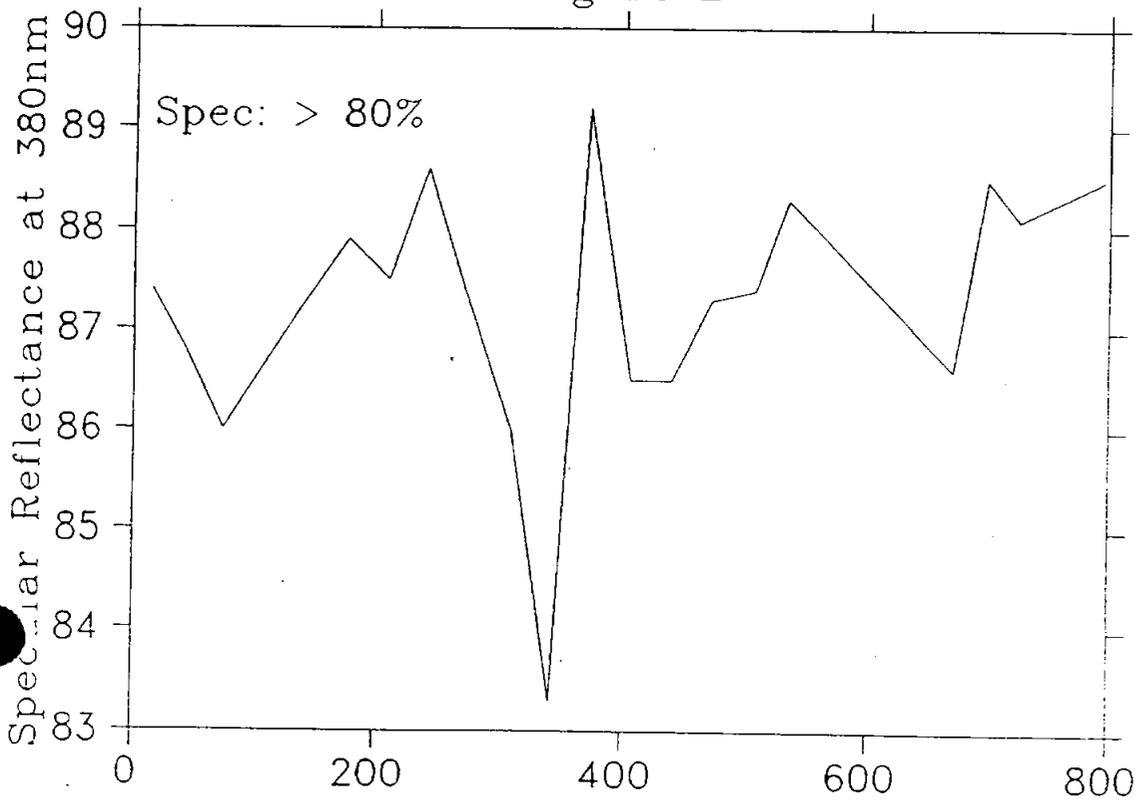


Figure 3

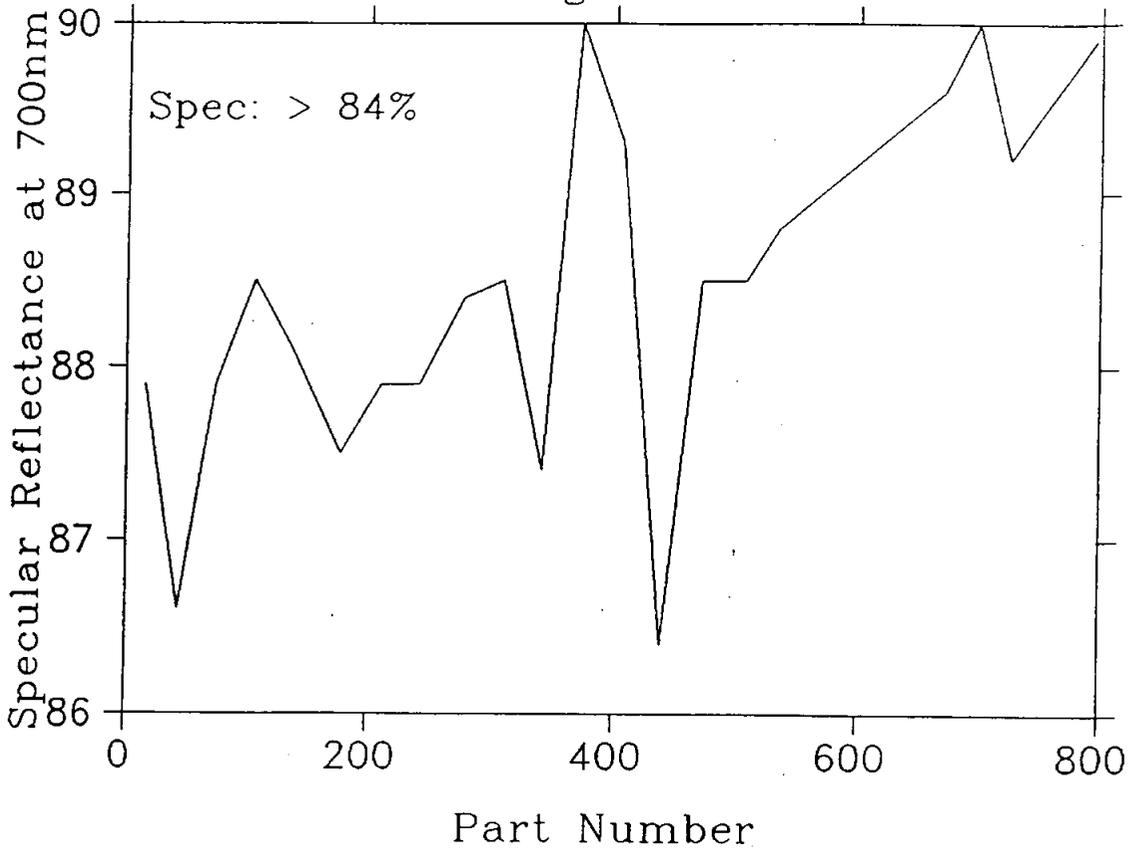


Figure 4

