U. S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
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National Bureau of Standards

Certificate

Standard Reference Material 2003a

First Surface Aluminum Mirror for Specular Reflectance from 250 to 2500 nm

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This Standard Reference Material (SRM) is intended for use in calibrating the photometric scale of specular reflectometers. SRM 2003a is 5.1 cm in diameter. The aluminum is vacuum deposited on a glass substrate and aged two years before calibration. No other protective coatings are applied to the mirror.

The specular reflectance of the mirror was measured at 50-nm intervals from 250 nm to 900 nm, 100-nm intervals from 900 nm to 1300 nm, and 250-nm intervals from 1500 nm to 2500 nm. In addition to these wavelengths, the reflectance was measured at the laser wavelengths 632.8 nm and 1060 nm. The certified values were determined in the following way. The reflectance of a master mirror was measured at the above specified wavelengths with a highly accurate specular reflectometer-spectrophotometer at angles of incidence of 6°, 30°, and 45°. These measurements were made for both vertically and horizontally polarized incident beams. The overall uncertainty in these measurements is ±0.2 percent. The specular reflectance of the SRM first surface mirror was measured relative to the master mirror on a high-precision reflectometer for 6° incidence only. The certified values of specular reflectance for the SRM mirror are based on the average value of the vertical and horizontal polarizations for the master mirror at 6° incidence. The certified values listed in Table 1 are assigned an uncertainty of ± 0.005. The uncertified data listed in Table 2 indicate the variation in the specular reflectance of a typical first surface SRM mirror as a function of angle of incidence and plane of polarization.

Figure 1 shows the spectral distribution of a typical first surface aluminum mirror. The wavelength scale of this plot is greatly compressed and the reflectance scale expanded to emphasize the absorption features. Note that the absorption band at 800 nm is an inherent characteristic of aluminum mirrors.

SRM 2003a cannot be cleaned without adversely affecting the aluminum coating. It is suggested that the mirror be handled carefully so as not to touch the aluminum surface and that the mirror be stored in a covered glass enclosure when not being used.

The calibration of this SRM was done in the Radiometric Physics Division of the Center for Radiation Research. The technical and support aspects involved in the certification and issuance of this SRM were coordinated through the Office of Standard Reference Materials by R. K. Kirby.

Washington, D.C. 20234
March 30, 1981

(over)

George A. Uriano, Chief
Office of Standard Reference Materials

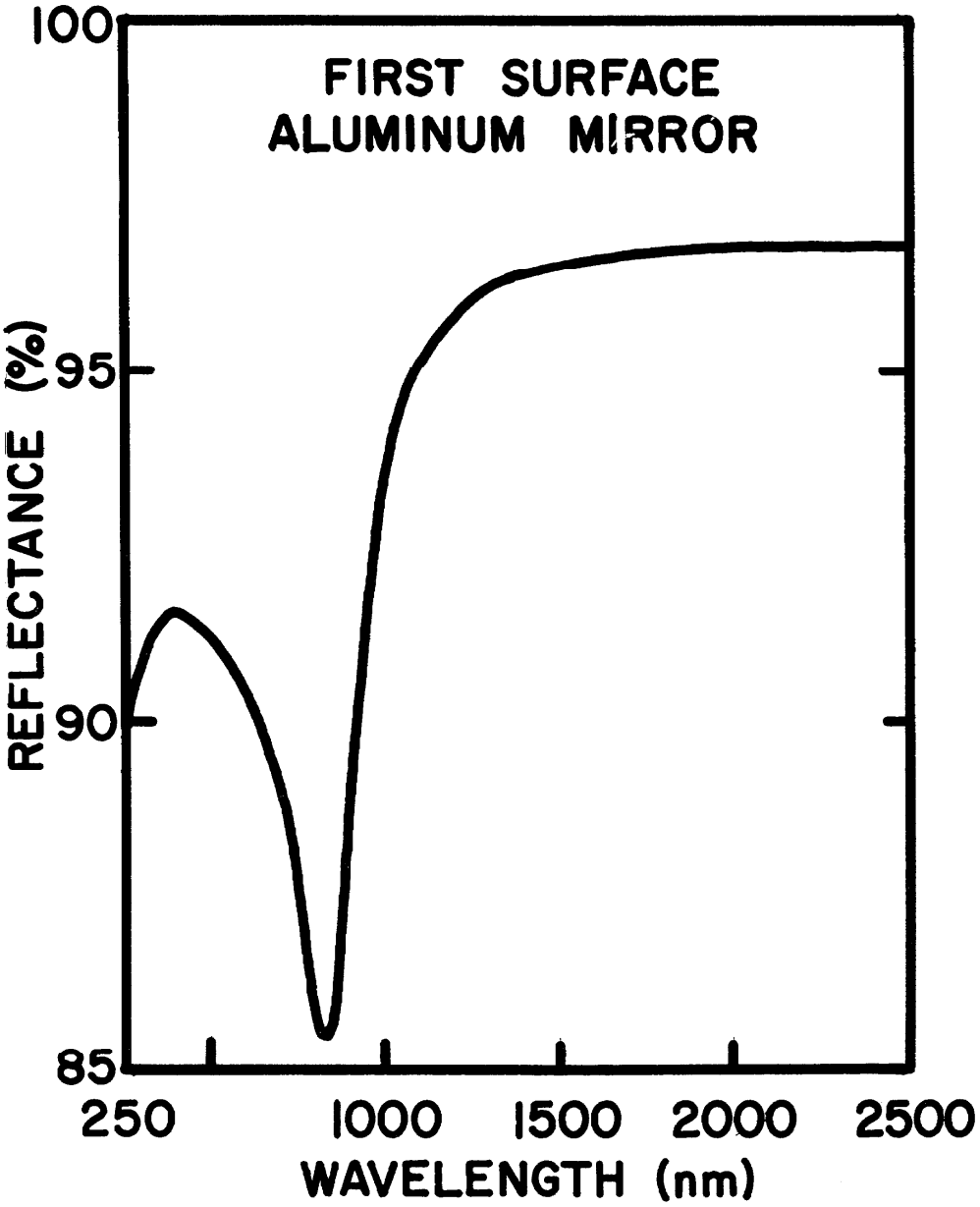
FIRST SURFACE
ALUMINUM MIRROR
100
95
90
85
REFLECTANCE (%)
250
1000
1500
2000
2500
WAVELENGTH (nm)

Table 1

First Surface Mirror

(6° Incidence)

Wavelength (nm)	Reflectance
250	0.895
300	.910
350	.914
400	.915
450	.913
500	.912
550	.909
600	.904
632.8	.901
650	.898
700	.890
750	.877
800	.857
850	.856
900	.890
1000	.935
1060	.947
1100	.951
1200	.958
1300	.962
1500	.965
1750	.967
2000	.968
2250	.968
2500	.968

Table 2

The spectral reflectance of a typical first surface mirror as a function of wavelength, angle of incidence, and polarization.

(These values are not certified)

Wavelength and Angle of Incidence	Parallel(p) Polarized	Perpendicular(s) Polarized	Unpolarized (ordinary)
250 nm			
6°	0.894	0.891	0.8925
30°	.882	.904	.893
45°	.867	.920	.8935
300 nm			
6°	.907	.904	.9055
30°	.898	.915	.9065
45°	.881	.929	.905
400 nm			
6°	.914	.913	.9135
30°	.903	.924	.9135
45°	.885	.937	.911
600 nm			
6°	.904	.905	.9045
30°	.892	.917	.9045
45°	.871	.932	.9015
800 nm			
6°	.856	.858	.857
30°	.837	.875	.856
45°	.806	.896	.851
1000 nm			
6°	.935	.936	.9355
30°	.929	.946	.9375
45°	.915	.956	.9355
1500 nm			
6°	.965	.966	.9655
30°	.964	.973	.9685
45°	.959	.978	.9685
2000 nm			
6°	.967	.968	9675
30°	.968	.976	.972
45°	.963	.981	.972
2500 nm			
6°	.966	.970	.968
30°	.970	.973	.9715
45°	.966	.980	.973