tion, one would adapt the parameters to the reflector at hand and seek to keep the phase deviation below some maximum allowable value across the range of angles of incidence for the field of view of the instrument of which the reflector is a part. To obtain compensation over a spectral band, it would be desirable to perform a wider optimization involving the bandwidth of the light and the dispersion characteristics of each dielectric layer.

The lower part of Figure 2 illustrates an example of compensation for the anisotropy of Figure 1 for monochromatic light. In this case a combination of $n_o = 1.5$, $n_e = 1.45$, $d_1 = d_2 = d/2$, and an overall thickness of 0.5676 wavelengths was chosen to satisfy a requirement to keep the maximum phase anisotropy below 0.0075° at angles of incidence as large as 13°.

This work was done by John Hong of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

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Optical Characterization of Molecular Contaminant Films

A theoretical model is correlated with measured spectral transmittances and VUV exposures of spacecraft optics.

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A semi-empirical method of optical characterization of thin contaminant films on surfaces of optical components has been conceived. The method was originally intended for application to films that become photochemically deposited on such optical components as science windows, lenses, prisms, thin-film radiators, and glass solar-cell covers aboard spacecraft and satellites in orbit. The method should also be applicable, with suitable modifications, to thin optical films (whether deposited deliberately or formed as contaminants) on optical components used on Earth in the computer microchip laser communications and thin-film industries.

The method is expected to satisfy the need for a means of understanding and predicting the reductions in spectral transmittance caused by contaminant films and the consequent deterioration of performances of sensitive optical systems. After further development, this method could become part of the basis of a method of designing optical systems to minimize or compensate for the deleterious effects of contaminant films. In the original outer-space application, these deleterious effects are especially pronounced because after photochemical deposition, the films become darkened by further exposure to solar vacuum ultraviolet (VUV) radiation.

In this method, thin contaminant films are theoretically modeled as thin optical films, characterized by known or assumed values of thickness, index of refraction, and absorption coefficient, that form on the outer surfaces of the original antireflection coating on affected optical components. The assumed values are adjusted as needed to make actual spectral transmittance values approximate observed ones as closely as possible and to correlate these values with amounts of VUV radiation to which the optical components have been exposed.

In an initial study, the method was applied in correlating measured changes in transmittance of high-purity fused silica photochemically coated with silicone films of various measured thicknesses and exposed to various measured amounts of VUV radiation. In each case, it was found to be possible to select an index of refraction and absorption coefficient that made the ultraviolet, visible, and infrared transmittance changes predicted by the model match the corresponding measured transmittance changes almost exactly.

This work was done by James T. Visentine of The Boeing Co. for **Johnson Space Center**.

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Johnson Space Center, (281) 483-0837. Refer to MSC-23931.