cally compatible with the thermal-barrier coating, and (3) exhibit at least a minor excitation spectral peak and an emission spectral peak, both peaks being at wavelengths at which the thermal-barrier coating is transparent or at least translucent.

Conventional thermographic phosphors are not suitable because they are most efficiently excited by ultraviolet light, which does not penetrate thermal-barrier coating materials. (Typical thermal-barrier coating materials include or consist of various formulations of yttria-stabilized zirconia.) Only a small fraction of phosphor candidates have significant excitation at wavelengths long enough (>500 nm) for sufficient penetration of thermal-barrier coatings. One suitable phosphor material — yttria doped with europium (Y_2O_3:Eu) — has a minor excitation peak at 532 nm and an emission peak at 611 nm. In experiments, this material was incorporated beneath a 100-µm-thick thermal-barrier coating and subjected to excitation and measurement by the luminescence-decay-time technique. These experiments were found to yield reliable temperature values up to 1,100 °C. At the time of reporting the information for this article, a search for suitable phosphors other than (Y_2O_3:Eu) was continuing.

This work was done by Jeffrey Eldridge of **Glenn Research Center**. *Further information is contained in a TSP (see page 1).*

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Commercial Technology Office, Attn: Steve Fedor, Mail Stop 4-8, 21000 Brookpark Road, Cleveland Ohio 44135. Refer to LEW-17617-1.

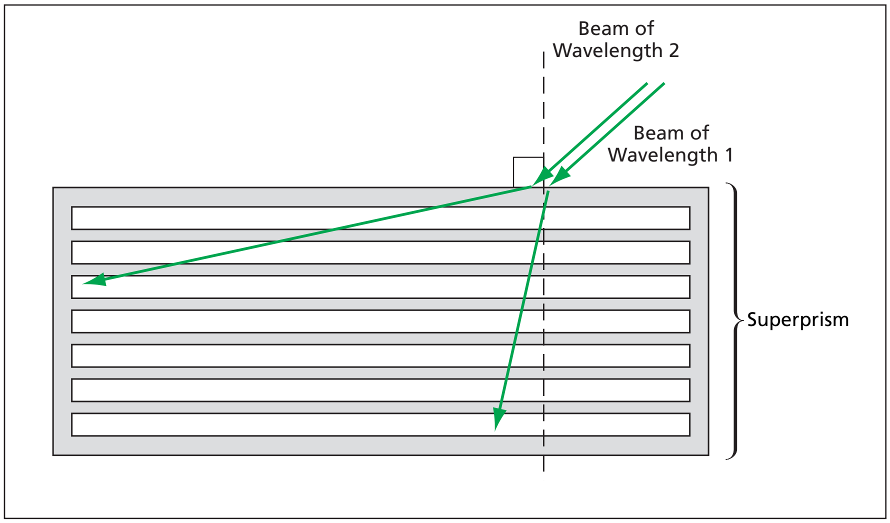
One-Dimensional Photonic Crystal Superprisms

In comparison with three-dimensional superprisms, these could be fabricated more easily.

NASA's Jet Propulsion Laboratory, Pasadena, California

Theoretical calculations indicate that it should be possible for one-dimensional (1D) photonic crystals (see figure) to exhibit giant dispersions known as the superprism effect. Previously, three-dimensional (3D) photonic crystal superprisms have demonstrated strong wavelength dispersion — about 500 times that of conventional prisms and diffraction gratings. Unlike diffraction gratings, superprisms do not exhibit zero-order transmission or higher-order diffraction, thereby eliminating cross-talk problems. However, the fabrication of these 3D photonic crystals requires complex electron-beam substrate patterning and multilayer thin-film sputtering processes.

The proposed 1D superprism is much simpler in structural complexity and, therefore, easier to design and fabricate. Like their 3D counterparts, the 1D superprisms can exhibit giant dispersions over small spectral bands that can be tailored by judicious structure design and tuned by varying incident beam direction. Potential applications include miniature gas-sensing devices.



A **One-Dimensional Superprism** could be fabricated more easily than a three-dimensional superprism. Like a three-dimensional prism, it would exhibit strong wavelength dispersion: two beams of light incident at the same angle and having slightly different wavelengths would be refracted at two widely different angles.

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

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, NASA Management Office– JPL at (818) 354-7770. Refer to NPO-30232.