

fluorinated resins ZPU-1279 and ZPU-1215 for the cladding and passive core regions, respectively. The EO (active) polymer was a guest–host complex of CLD-1 chromophore and amorphous polycarbonate (APC). The device was constructed by spin-coating the lower cladding and the passive core layers of the device onto a silicon substrate. A layer of the EO polymer was then deposited on top of the passive layer, the nonessential areas removed by reactive ion etching, and vertical tapers etched to reduce the loss as the light couples from the passive to the EO waveguides. The active structure was then covered with the upper passive core and cladding layers. Standard photolithography was used to create the waveguide patterns and gold electrodes were formed by vacuum evaporation and photolithography inside both cladding layers. The arms of the modulator were poled, that is, the CLD-1 chromophores were aligned, by application of 500 V poling voltage with the modulator held at 145°C in N<sub>2</sub> atmosphere.

The modulator efficiency was measured by coupling 1.55- $\mu\text{m}$  transverse-magnetic-polarized light into the device and focusing the output signal onto a photodetector. The measured EO coefficient was 20% smaller than the best values exhibited by the researchers' conventional modulators utilizing the same EO polymer. The researchers believe that the low efficiency is the result of incomplete poling due to the high resistivity of the passive core

polymer, and will improve if different materials are used. Mode profile studies, on the other hand, showed a tenfold reduction in fiber-waveguide coupling loss and a reduced chip loss when an EO polymer was replaced by the passive material used in this study.

GREG KHITROV

### Inert Liquid Paraffin Speeds Preparation of Large, Crack-Free Mesostructured Silica Monoliths

Bulk mesostructured materials with a high orientation order at the macrolevel are attracting current interest, in particular for developing novel sensors, micro- and optoelectronics, and separation devices. However, industrial applications are limited because of the absence of an adequate route for the preparation of large-sized, crack-free silica monoliths. Researchers from the Department of Chemistry of Fudan University, Shanghai, China, have demonstrated a fast way to prepare mesoporous silica monoliths by using solvent evaporation and a liquid paraffin medium as a morphology protector, as reported in the January issue of *Chemistry of Materials*.

Dongyuan Zhao and co-workers synthesized mesostructured silica monoliths through solvent evaporation from the silica gel by using tetraethoxysilane as a silica source and poly-(ethylene oxide)-poly-(propylene oxide)-poly(ethylene oxide) (EO<sub>20</sub>PO<sub>70</sub>EO<sub>20</sub>) amphiphilic block copolymer as a template. They removed

the residue of the solvent by heating the obtained silica gel, covered by a layer of inert liquid paraffin, at relatively high temperatures (60–90°C), which reduced the processing period to 8 h and preserved the macromorphology of the monolith from cracking.

According to the theory of the sol-gel process, the stress that causes cracking is mainly attributed to the internal pressure gradient, which arises as a result of the loss of permeability of the gel or different diameters of the pores. Liquid paraffin is able to fully separate the gel from the atmosphere, reducing damage caused by the internal pressure gradient in three ways. The evaporation rate during heating accelerates slowly and the viscosity of the liquid decreases, which increases the permeability of the gel. The flaws at the surface of the gel are filled with paraffin, replacing the initial alcohol–vapor interface by the alcohol–paraffin interface. This reduces the internal pressure that would otherwise pull the flaws open. During heating, paraffin restrains the rates of evaporation in the pores of all sizes as compared to those without a paraffin cover, which keeps the pores empty for the most part. This technique, the researchers conclude, prevents the gel from cracking while attaining uniform shrinkage. Furthermore, Fourier transform infrared spectroscopy revealed that paraffin does not penetrate into the material, thus the paraffin acts only as a macromorphology protector, and does not change the chemical composition of the final mesostructured silica monolith.

ANDREI A. ELISEEV

### Space Shuttle Columbia Disaster: Materials Issues

[www.mrs.org/gateway/columbia.html](http://www.mrs.org/gateway/columbia.html)

While returning from orbit on February 1, 2003, the Space Shuttle Columbia and all seven crewmembers were lost over north central Texas. Columbia was returning from a 16-day scientific research mission. Aboard Columbia were Commander Rick Husband; Pilot William McCool; Mission Specialists Dave Brown, Kalpana Chawla, and Laurel Clark; Payload Commander Mike Anderson; and Payload Specialist Ilan Ramon of the Israel Space Agency.

Initial speculation suggested that materials-related failure issues may have contributed to the shuttle accident. However, at press time, the conclusion was far from certain.

NASA Administrator Sean O'Keefe announced the formation of a Space Shuttle Mishap Interagency Investigation Board, which will provide an independent review of the events and activities that led up to the Columbia tragedy. The board is chaired by retired U.S. Navy Admiral Harold W. Gehman Jr.

The research mission, identified as STS-107, included over 80 experiments. Among the materials-related studies was one on zeolite crystal growth (Center for Advanced Microgravity Materials Processing, Northeastern University, Boston). The purpose of this continuing study is to understand how to manipulate the nucleation and growth of zeolite in order to use it for hydrogen-fuel storage. In another experiment, students from Ort-Matzkin School (Haifa, Israel) participating in NASA's educational program sent a chemical garden in which the growth mechanisms of crystalline fibers in microgravity were investigated.

For updates on materials news relating to the Columbia disaster, access the Materials Research Society Web site at [www.mrs.org/gateway/columbia.html](http://www.mrs.org/gateway/columbia.html).

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### Correction

In the February 2003 issue of *MRS Bulletin*, page 143, the correct affiliation for Stanley Israel (far right in the photo) is a Member of the Board of the American Chemical Society.



**PREVIEW:**  
**2003 MRS Spring Meeting**  
See page 204.