

ture of the present version of the process is the use of centrifugation to ensure complete permeation of the template by the hot agarose solution.

To satisfy the requirement for sustained or timed release of nerve-growth agents, it has been proposed to incorporate, into scaffolds, reservoirs containing such agents. In cases in which the agent is BDNF, the proposal encompasses an alternative approach in which the reservoirs would be filled with genetically engineered cells that secrete BDNF. The figure illustrates the proposal as it might be implemented in a scaffold that would

be attached to the severed ends of a peripheral nerve. Attached to the scaffold would be open-ended sleeves that would enable attachment to the severed nerve ends. The pores in the scaffold would serve as channels to guide the growth of the nerve ends toward each other. The reservoir containing the nerve-growth agent would be integrated into the outer wall of the scaffold. The nerve-growth agent would be delivered from the reservoir to the channels by diffusion through the agarose hydrogel matrix.

*This work was done by Jeffrey Sakamoto of Caltech and Mark Tuszynski of UC*

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*In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:*

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*Refer to NPO-45303, volume and number of this NASA Tech Briefs issue, and the page number.*

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## Chemically Assisted Photocatalytic Oxidation System

*Lyndon B. Johnson Space Center, Houston, Texas*

The chemically assisted photocatalytic oxidation system (CAPOS) has been proposed for destroying microorganisms and organic chemicals that may be suspended in the air or present on surfaces of an air-handling system that ventilates an indoor environment. The CAPOS would comprise an upstream and a downstream stage that would implement a tandem combination of two partly redundant treatments. In the upstream stage, the air stream and, optionally, surfaces of the air-handling system would be treated with ozone, which would be generated from oxygen in the air by means of an

electrical discharge or ultraviolet light. In the second stage, the air laden with ozone and oxidation products from the first stage would be made to flow in contact with a silica-titania photocatalyst exposed to ultraviolet light in the presence of water vapor. Hydroxyl radicals generated by the photocatalytic action would react with both carbon-containing chemicals and microorganisms to eventually produce water and carbon dioxide, and ozone from the first stage would be photocatalytically degraded to O<sub>2</sub>. The net products of the two-stage treatment would be H<sub>2</sub>O, CO<sub>2</sub>, and O<sub>2</sub>.

*This work was done by Jean Andino, Chang-Yu Wu, David Mazyck, and Arthur A. Teixeira of the University of Florida for Johnson Space Center. Further information is contained in a TSP (see page 1).*

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## Use of Atomic Oxygen for Increased Water Contact Angles of Various Polymers for Biomedical Applications

**Improved polymer hydrophilicity is beneficial for cell culturing and implant growth.**

*John H. Glenn Research Center, Cleveland, Ohio*

The purpose of this study was to determine the effect of atomic oxygen (AO) exposure on the hydrophilicity of nine different polymers for biomedical applications. Atomic oxygen treatment can alter the chemistry and morphology of polymer surfaces, which may increase the adhesion and spreading of cells on Petri dishes and enhance implant growth. Therefore, nine different polymers were exposed to atomic oxygen and water-contact angle, or hydrophilicity, was measured after exposure. To determine whether hydrophilicity remains static after initial atomic oxygen exposure, or changes with higher fluence ex-

posures, the contact angles between the polymer and water droplet placed on the polymer's surface were measured versus AO fluence. The polymers were exposed to atomic oxygen in a 100-W, 13.56-MHz radio frequency (RF) plasma asher, and the treatment was found to significantly alter the hydrophilicity of non-fluorinated polymers.

Pristine samples were compared with samples that had been exposed to AO at various fluence levels. Minimum and maximum fluences for the ashing trials were set based on the effective AO erosion of a Kapton witness coupon in the asher. The time intervals for ashing

were determined by finding the logarithmic values of the minimum and maximum fluences. The difference of these two values was divided by the desired number of intervals (ideally 10). The initial desired fluence was then multiplied by this result (2.37), as was each subsequent desired fluence. The flux in the asher was determined to be approximately  $3.0 \times 10^{15}$  atoms/cm<sup>2</sup> sec, and each polymer was exposed to a maximum fluence of  $5.16 \times 10^{20}$  atoms/cm<sup>2</sup>.

It was determined that after the shortest atomic oxygen exposure (fluence of  $2.07 \times 10^{18}$  atoms/cm<sup>2</sup>), non-