Future brightens for conducting polymers

Electronically conductive polymers may soon leap from small-scale laboratory experiments to large-scale commercial applications ranging from airplane lightning protection to anti-static coatings for clothes and other items, predicted materials researchers this week at a meeting of the American Chemical Society in Dallas.

In a symposium resembling an adult form of show-and-tell, scientists reported advances in processing conducting polymers into usable fibers, films and other shapes. Until recently, attempts to marry the morphological, textural and mechanical versatility of polymers with metal-like electronic conductivity resulted in materials that resisted processing into usable forms.

By cleverly choosing reaction conditions and modifying the chemical building blocks, or monomers, that make up the huge polymer molecules, scientists have succeeded in creating conducting polymers they can manipulate with the same techniques used for processing such conventional polymers as nylon.

Hans H. Kuhn and his colleagues at Milliken Research Corp. in Spartanburg, S.C., say they have developed what Kuhn calls "an industrially feasible process" for depositing uniform films of polypyrrole or polyaniline — two of the most studied conductive polymers — onto the fibers of virtually any textile.

When the fibers absorb dilute solutions of the monomers pyrrole or aniline, monomer concentration increases at the fiber surface, where the monomers polymerize into a thin film. An oxidizing agent such as ferric chloride initiates polymerization. Treating nylon, polyester or other fabrics in this way makes them conductive without affecting their texture or strength, Kuhn reports.

Kuhn told Science News that electrically conductive textile composites like these could prove useful as electromagnetic screening materials for securing, say, government offices from outside electronic surveillance. Instead of escaping to the outside, where they would be vulnerable to interception, internally generated electromagnetic signals would be trapped by the conductive textile composite, which could be built into office walls. Wherever static electricity poses problems — in clothes and on computer monitors, for example — these new textiles would help, he says.

Chemist John R. Reynolds and his colleagues at the University of Texas at Arlington have developed an electrochemical technique for making a water-soluble, more easily formable molecular composite involving the conducting polymer polypyrrole and Du Pont's tough and stable polymer known as Kevlar. The resulting conductive composite withstands higher temperatures and is tougher than the unblended polypyrrole, Reynolds says.

According to symposium organizer Paul Smith of the University of California, Santa Barbara, this technique and others reported at the symposium should usher conducting polymers into commercial application within five years. Like semiconducting materials, conducting polymers rest between metals and insulators on the scale of electronic conductivity. Semiconducting materials such as silicon led to the microelectronics revolution, Smith notes. Conducting polymers could have an equally unexpected payoff, he suggests. — *I. Amato*

All-out attack on deadly bone cancer

Total-body radiation and extra chemotherapy added to conventional treatment sounds like a drastic approach to a childhood cancer. Yet in the case of Ewing's sarcoma, the extra treatment may provide hope for patients at high risk of relapse and death, according to research presented last week at the American Cancer Society's 31st Science Writers' Seminar in Irvine, Calif.

Robert B. Marcus Jr. and his colleagues at the University of Florida in Gainesville have treated 20 high-risk patients with the experimental therapy; statistical projections indicate 60 percent will remain disease-free up to four years after the end of treatment. In contrast, 25 similar patients treated conventionally from 1977 to 1984 had only a 20 percent chance of disease-free survival after four years, Marcus reports.

Ewing's sarcoma, a particularly lethal cancer, usually strikes people between the ages of 10 and 25. Standard treatment involves radiation targeting only the primary tumor, followed by chemotherapy. But such treatment often fails to kill the microscopic seeds of cancer that have traveled to distant parts of the body. "Almost all of the patients are in complete remission as far as we can detect it after standard chemotherapy," Marcus says. "But we know from the cure rate that 80 or 90 percent will relapse."

To combat these odds, Marcus and his colleagues gave high-risk patients — those with tumors larger than 10 centimeters and evidence of cancer spread — five cycles of standard chemotherapy consisting of vincristine, cyclophosphamide and doxorubicin hydrochloride. Patients also got primary-tumor radiation. In addition, they received 800 centigrays of total-body radiation followed by a final chemotherapy dose.

The treatment is a harsh one. The radiation blast kills tumor cells, but it also destroys normal bone marrow and white blood cells, leaving patients vulnerable to life-threatening infection, Marcus says. The researchers take the bone marrow from each patient after the second chemotherapy cycle and transfuse it back into the patient's bloodstream after the final radiation treatment. Patients must remain in isolation for six weeks while the autologous transplant takes hold.

The researchers say they believe the transplanted marrow is cancer-free, pointing out that chemotherapy and freezing should kill any cancer cells. "We can't be 100 percent sure," Marcus notes, acknowledging that some patients have already relapsed. Other researchers, including Eli Glatstein at the National Cancer Institute, echo the uncertainty. Glatstein points to a trial, described in the March 1988 Journal of Clinical Oncology, in which he and his colleagues gave Ewing's sarcoma patients chemotherapy — with drugs that differed from Marcus' regimen — and total-body radiation followed by an autologous marrow transplant. The team's early success was marred by a high relapse rate three to five years after treatment, he says.

Marcus and his colleagues are tinkering with their regimen to make it safer and more effective. Long-range follow-up is needed to see whether these patients will survive the cancer and the treatment, Marcus says. — *K.A. Fackelmann*

Looking well beyond the Great Attractor

Over and above the motion associated with the uniform expansion of the universe, our own galaxy and its neighbors have an additional motion. They seem part of a large-scale flow toward a distant, vast region of space dubbed the Great Attractor. The name suggests the presence of a large concentration of mass that gravitationally draws matter toward it. Now a team of Italian astronomers has identified another massive aggregation of galaxies in roughly the same direction but three times farther away.

The finding has important consequences for theories attempting to account for the distribution of matter in the universe. "Detailed study of this region is very important, not only because no similar nearby concentration of [galaxy] clusters exists elsewhere, but also because of its direction," report R. Scaramella of the International School for Advanced Studies in Trieste, Italy, and his colleagues in the April 13 Nature.

This newly discovered concentration of clusters packed with galaxies falls on a line nearly a billion light-years long that also runs through the Great Attractor, the local supercluster (which includes our own galaxy) and another large aggregation known as the Perseus-Pisces super-