Molecules shuttle electrons to and fro

Shaped like a bead on a string with knotted ends, compounds called rotaxanes can act as molecular shuttles, sliding back and forth and ferrying electrons from one end of the string to the other. This useful characteristic has led researchers to tap rotaxanes as potential components for molecular machines and electronics. Two recent studies examine how the sliding movement of these compounds can be controlled and how they accept and deliver their electron cargo.

Alexander S. Lane, David A. Leigh, and Aden Murphy of the University of Manchester in England created a rotaxane with a ring-shaped molecule as the bead, a peptide as the string, and bulky chemical groups as the knots on the ends. They designed the peptide to have three "stations"—one on each end and one in the middle—where the bead can pause during its travels.

The researchers found that they can control the way the bead moves and stops along the peptide by changing the solvent in which the compound is dissolved. In one solvent, the bead shuttles constantly between the stations on the ends, merely passing through the station in the middle; adding tiny amounts of a second solvent increases the shuttling speed dramatically. In a third solvent, however, the bead "spends nearly all of its time" at the station in the middle, the authors say. The group's report appears in the Nov. 12 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY.

Jean-Pierre Sauvage and his colleagues at Louis Pasteur University in Strasbourg, France, synthesized another group of rotaxanes that can transfer electrons from one knot to the bead. The knots on the end of their string are molecules called zinc porphyrins, which are good electron donors. The rotaxane bead consists of a ring with a gold porphyrin attached to it like a pendant. The gold porphyrin is a good electron acceptor.

By making a rotaxane short enough that the bead cannot slide very far, the scientists were able to focus on the transfer of electrons from the zinc to the gold porphyrin—a process that happens in less than a nanosecond, they find. The researchers designed the rotaxanes to have no chemical bond between the bead and the string. That way, they can tell that the electrons are passed directly through space rather than being siphoned through bonds—a crucial distinction when studying electron transfer. The researchers describe their work in the Nov. 19 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY. —*C.W.*

Chemical safety board revived

After being stymied by lack of both funds and administrative support for the past 7 years, an independent agency charged with investigating the cause of chemical accidents is finally taking root. The five-member Chemical Safety and Hazard Investigation Board (CSHIB) received a $4 million start-up budget for next year. Although he opposes the board, President Clinton spared it from a line-item veto on Nov. 1.

The CSHIB was originally created in 1990 and modeled after the National Transportation Safety Board, which investigates major transportation accidents such as plane crashes. Three members were appointed in 1994, but the board's funding was withdrawn a few months later.

In 1995, a joint investigative group was formed by the Environmental Protection Agency and the Occupational Safety and Health Administration, with members from each agency. This summer, members of Congress became concerned about the group's slow progress and potential conflicts of interest and sought to revive the CSHIB.

Today, two slots on the board remain to be filled, and the existing members are deciding on guidelines for determining which accidents to investigate. On average, a chemical accident resulting in evacuation, injury, or death occurs every day or two in the United States. —*C.W.*