Nations Draft Kyoto Climate Treaty

It was a hard-won agreement, but after 10 days that ended last week in a marathon dusk-to-dawn negotiating frenzy, representatives of 160 nations finally thrashed out compromise wording for a new treaty to protect the global environment.

At its heart, the Kyoto Protocol, named for the Japanese city in which it was completed, seeks to rein in human activities that emit greenhouse gases. Atmospheric concentrations of the targeted pollutants, some of which have been growing since the dawn of Western industrialization, have reached a level that worries scientists. Theory, computer models, and climate-monitoring data all suggest that these gases are at or near the point where they could provoke a global warming that would shift patterns of rainfall, raise sea levels, and increase weather variability.

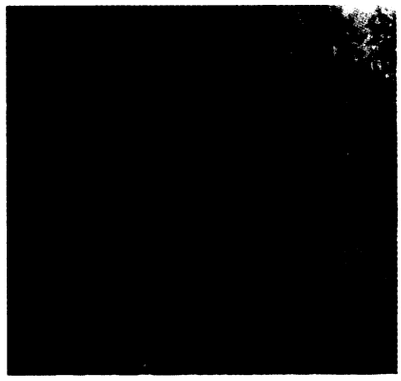
The European Union had wanted to limit the new curbs to just carbon dioxide, methane, and nitrous oxide. The United States succeeded in adding limits on three more—hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Collectively, the industrial countries agreed to drop emissions of these pollutants to 5.2 percent below their 1990 levels for the first three gases and to 5.2 percent below a later baseline for the three fluorocarbons. The deadline for achieving these cuts is 2012.

Individually, the nations must achieve differential limits. The European Union, the United States, and Japan agreed to cutbacks of 8 percent, 7 percent, and 6 percent, respectively. The Russian Federation, Ukraine, and New Zealand must return to 1990 levels, while Australia and Iceland have to stabilize their releases at 8 and 10 percent, respectively, above 1990 levels.

The treaty divides industrial countries into two "bubbles." Within a particular bubble, nations that achieve more than their required greenhouse gas reductions may trade or sell pollution rights—not to exceed their excess—to another country (SN: 5/24/97, p. 320).

Emissions credits for preserving forests or planting new ones were another hotly contested U.S. provision that won adoption. As trees grow, they soak up and retain large quantities of carbon dioxide (SN: 12/24&31/88, p. 411). The protocol allows industrial nations to receive some emissions credit for any land forested since 1990, but they must increase their reductions to account for any land deforested since then.

How much credit forests will receive was not settled. It's one of the unresolved issues to be ironed out next November when treaty negotiators reconvene in Buenos Aires.



Forest preservation has become part of the emissions equation.

While the new treaty would impose binding emissions limits on 39 nations, 121 less economically developed nations escaped regulation during this round of talks. Many of these are already emitting large amounts of greenhouse gases, and those emissions are expected to grow rapidly.

The U.S. Senate has pledged not to adopt a treaty that does not require "meaningful participation" by developing countries. So "what we have here is not ratifiable by the Senate," says Sen. John Kerry (D-Mass.), though the United States may begin abiding by the treaty even before it is ratified. In any case, he calls the treaty a "very significant first step."

Gail McDonald of the Global Climate Coalition in Washington, D.C., which represents many fossil fuel and other industry groups, expresses concern that the U.S. commitment may require something close to "cutting [U.S.] energy use by a third in 10 years." Big industry won't be the only one having to make those cuts, she says, "but you and me and our thermostats."

Moreover, she contends, by agreeing to those limits now, "the U.S. has lost a lot of its bargaining power" in compelling developing countries to curb their emissions or in working out details on issues such as emissions trading. —*J. Raloff*

Electric diode tunes in to plastic

Many polymers are called plastics because of their mechanical flexibility, but these materials are chemically versatile as well. Now, a researcher has used a polymer to remake a basic electronic component—a diode. By adjusting the electrochemical properties of the polymer, he makes the diode show a wide range of current-carrying capacities.

The device "puts a new tool in the toolbox of electrical engineers," says Mark C. Lonergan of the University of Oregon in Eugene. He reports his finding in the Dec. 19 SCIENCE.

Conventional diodes join a semiconductor and a metal, creating a junction that allows current to flow in only one direction. The new diode uses indium phosphide as the semiconductor and replaces the metal with polypyrrole, a polymer that conducts electricity (SN: 8/23/97, p. 119). A gold mesh embedded in the polypyrrole acts as the electric contact.

Lonergan adjusts polypyrrole's electrochemical properties by essentially making it part of a battery. After attaching electrodes to the gold mesh, he immerses the device in a liquid source of ions. By applying a small control voltage, Lonergan can "tune" the diode by adding or removing electrons from the polymer. This process changes the diode's current-carrying capacity.

"It combines in a single device a collection of properties that you would normally have to get from a whole series of separate semiconductor-metal interfaces," Lonergan says.

The tunability of the diode makes it a good platform for exploring the basic "technical aspects of metal-semiconductor contacts," says J. Campbell Scott of the IBM Almaden Research Center in San Jose, Calif. Scott doubts that the polymer diode will ever replace the conventional ones used today, but he says the new device opens up possibilities for future applications.

Polymer diodes could be used as tunable sensors with a range of sensitivities, Scott suggests. They could also form the heart of multiple-state computer memories, says Lonergan. Instead of adopting just two states, as in standard binary computer logic, a tunable diode could exist in several different states.

For practical applications, the diode needs several technical improvements, such as an increased electric switching speed and replacement of the liquid ion source with a solid. Lonergan is also planning to conduct more tests on the stability of the device, since frequent electric switching quickly degrades conducting polymers. —*C. Wu*