

## Flying Gold Molecules

Organometallic chemists are finding new ways to make gold molecules that "fly," and to control where they land. The result is a new way to make thin gold films for the electronics industry. Gold is very important in microelectronics, especially for connecting individual components and forming switches. It is preferred over other materials like copper and aluminum because gold conducts electricity very well, and is not corroded by the oxygen and water in the atmosphere. But gold is expensive, so making a thin film of it saves money as well as space.

Thin films can now be made through a process called "Chemical Vapour Deposition," or CVD, as long as the coating material is part of a compound that can be easily vaporized. For instance, a thin silicon coating—the kind used in some solar cells—can be obtained when silane,  $\text{SiH}_4(\text{g})$ , is passed over a hot object. It decomposes into two molecules of hydrogen that are carried off in the gas stream, and one atom of silicon, which stays on the surface.

There are two special problems involved in making gold films by CVD, but recent research has solved them both. First, for a heavy element like gold, it is hard to find a molecule that is volatile enough to "fly."

Now Richard Puddephatt at the University of Western Ontario in London, Ont. has found one—the alkylgold compound  $\text{CF}_3\text{-Au-C}^\ominus\text{N-CH}_3$  works especially well. It is a solid but it vaporizes easily and, on contact with hot objects, it decomposes into a very pure gold coating.

The second problem is that microelectronics often requires the gold to be deposited as very thin lines that connect individual components on a silicon wafer. Obviously, the CVD process will coat more than just those lines if the whole wafer is heated.

The solution is to focus a laser beam to create intense heat only where the coating is desired. Then, as the alkylgold compound flies over the wafer, the gold film forms only where the laser beam is focused. The resulting lines can be made just a few nanometers thick.

The entire gold circuit is traced out with 'laser writing' — moving the laser beam around on the wafer. That kind of writing makes a valuable point!