

because intermediate products outcompete methane in reacting with oxygen, explains Eric R. Evitt of Catalytica. But in the new process, methyl bisulfate resists further oxidation. So, much to the surprise of the Catalytica scientists, this mercury-catalyzed reaction yields 43 percent methanol. It also requires milder reaction conditions and a lower temperature than other approaches, Evitt says.

"It's very interesting — and good science," comments Richard H. Fish, an organometallic chemist at the Lawrence Berkeley (Calif.) Laboratory. "It's probably going to be a lot more energy-efficient [than other conversion strategies]."

"But a process that has mercury and sulfuric acid could be an environmental nightmare," he adds.

The Catalytica group stresses that more work is required to determine the commercial potential of this promising laboratory result. "We must learn more about the reaction and under what conditions it will work," says Evitt.

In a separate report, two chemical engineers have reconfigured conventional cat-

alysts to streamline the production of syngas. Their reaction works so fast — on the order of milliseconds versus seconds — that it requires a much smaller reaction chamber than current syngas processes, says Lanny D. Schmidt at the University of Minnesota in Minneapolis. He and Daniel A. Hickman, now at Dow Chemical Co. in Midland, Mich., have also shown that the catalyst rhodium leads to very high yields of syngas — 10 molecules of hydrogen and carbon monoxide for each molecule of water and carbon dioxide.

Although methane usually catches fire when it comes into contact with oxygen, it will not burn when there is a large excess of oxygen present, Schmidt explains. He and Hickman force such an oxygen-rich methane mixture through a clear quartz tube with a diameter about the size of a quarter. Inside, a porous aluminum plug coated with rhodium or platinum causes the methane to ignite and convert to hydrogen and carbon monoxide.

To scale up for commercial application, "You just sort of build a bigger tube," Schmidt says.

— E. Pennisi

## Depressing news for low-cholesterol men

Sometimes you can't win for losing. Case in point: New evidence indicates that elderly men boasting low cholesterol levels also suffer markedly more symptoms of depression than peers with moderate or high cholesterol levels.

If further research confirms this finding, medical attempts to lower concentrations of cholesterol in the blood should probably be restricted to people at high risk of heart disease, contend physician Elizabeth L. Barrett-Connor of the University of California, San Diego, and her colleagues. Additional studies may also find that the elderly have higher "ideal" cholesterol concentrations than younger people, Barrett-Connor's team suggests in the Jan. 9 LANCET.

From 1985 to 1987, the scientists measured the weight, cholesterol levels, and responses to a standard depression questionnaire of 1,020 white men age 50 to 89. Participants were part of a survey, begun in 1972, of risk factors for heart disease. They all worked or had worked in managerial or professional jobs.

Volunteers fell into one of four cholesterol categories: A concentration of less than 160 milligrams of cholesterol per deciliter of blood was considered low; between 160 and 199, normal; between 200 and 239, borderline; and 240 or greater, high.

Among men age 70 and older, nine of 75 in the low-cholesterol group — about 16 percent — reported symptoms of mild to severe depression. From 3 percent to 8 percent of their peers in higher cholesterol groups suffered mild forms of depression or worse. No link emerged between cholesterol and depression among younger men.

A person classed as depressed on the questionnaire does not necessarily meet psychiatric criteria for moderate or severe depression, the researchers note.

Reasons for the association between low cholesterol and more frequent and intense symptoms of depression, as well as the link's restriction to older men, remain unclear, they acknowledge. However, the investigators suspect that low cholesterol helps to produce depression.

Several cholesterol-reduction trials have found unexpected jumps in suicide and other violent deaths, they note. Low cholesterol may foster both aggressive behavior and depression by somehow reducing concentrations of the chemical messenger serotonin, possibly compounding natural serotonin loss in the elderly, the San Diego scientists assert.

Moreover, neither weight loss (which often lowers cholesterol) nor the presence of various medical problems accounted for the link between cholesterol and depression.

— B. Bower

## Measuring superconductor magnetic noise

A superconductor carries electrical current without resistance. It also shields itself from the effects of magnetic fields in which it is placed by preventing such fields from penetrating into its interior. But if the electrical current is too high or if the applied magnetic field is sufficiently strong, a superconductor begins to resist the flow of current.

Now researchers have observed measurable, though minuscule, resistance in a thin, superconducting film of yttrium barium copper oxide fashioned into a tiny transformer — even when the applied magnetic field is extremely small.

Frederick C. Wellstood of the University of Maryland at College Park and his collaborators report their findings in the Jan. 4 PHYSICAL REVIEW LETTERS.

Normally, an external magnetic field begins to penetrate a superconductor when the field exceeds a certain critical value. The penetrating magnetic field exists within the superconductor in the form of separate vortices — whirlpools of electric current. The number of vortices present depends on the strength of the magnetic field.

But researchers have also detected vortices when the applied magnetic field is much less than the critical value. "Sometimes the magnetic flux will go in with even the slightest amount of field," says Roger H. Koch of the IBM Thomas J. Watson Research Center in Yorktown Heights, N.Y.

Wellstood and his co-workers apparently measured the electrical resistance caused by the motion of isolated vortices

Power of 10	Prefix	Symbol
24	yotta	Y
21	zetta	Z
-21	zepto	z
-24	yocto	y

Recent additions to metric prefixes list.

associated with defects in a superconducting thin film. "The picture we have is that there are two low-energy places where a vortex can be," Wellstood says. "It's the rattling back and forth from one to the other that produces the magnetic flux noise." This phenomenon, in turn, leads to resistance and a measurable voltage when an electrical current flows through the material.

"When we did the calculations, we realized that the voltages we were measuring were incredibly small — so small that we didn't know what units to use," Wellstood says.

The researchers came up with "milli-attovolt" — one-thousandth of an attovolt, where the prefix "atto" represents  $10^{-18}$ . They didn't realize that the international group charged with defining the modern metric system had anticipated such a possibility and adopted appropriate prefixes (see table).

Wellstood and his colleagues have already used a special microscope for detecting magnetic fields to confirm that vortices are present in their samples. By increasing the resolution of their instrument, they hope eventually to locate vortices and see how much an individual vortex moves around.

— I. Peterson