Chemistry

Dryer lint snares more than just fuzz

Analyzing laundry dryer lint appears to be an easy way to screen homes for elevated lead levels, according to a new study.

Peter G. Mahaffy of the King's University College in Edmonton, Alberta, and his colleagues tested dryer lint in an effort to determine the exposure of radiator-repair shop workers and their family members. The researchers compared dryer lint samples from homes with no known sources of lead exposure, a public laundry, and the homes of people working in auto and truck radiator shops.

In 1994, the Edmonton Board of Health became concerned after one radiator mechanic showed symptoms of lead poisoning and his child was found to have elevated blood lead concentrations.

Dryer lint from the homes of the radiator-shop employees showed much higher amounts of lead than the other samples. "The highest level measured was 70 to 80 times" that of the others, Mahaffy says. The scientists determined that bits of lead solder stuck to the mechanics' work clothes and showed up on fabric fibers in the lint. Using X-ray fluorescence spectroscopy, the researchers determined that the metal flecks in the lint were composed of lead and tin (the elements of solder). "It was a nice piece of detective work," Mahaffy says.

The researchers report their findings in the Aug. 15 ENVIRONMENTAL SCIENCE AND TECHNOLOGY.

Examining dryer lint may be a good screening test for finding persons exposed to large amounts of lead, says Mahaffy. Definitive tests for lead are "quite intrusive," requiring blood tests and X rays of the shin bone. Having participants collect lint for the study had the added benefit of increasing their awareness of the issue, he notes. —*C.W.*

All we need now is a nanocable guy

A team of researchers has made a miniature, multilayer wire less than 50 nanometers in diameter.

Like the coaxial cables used to transmit television signals, the wire consists of several components nested together. The nanocable has a core of the semiconductor silicon carbide surrounded by a layer of insulating silicon oxide, wrapped in a layered sheet of boron nitride and carbon.

The multilayer nanocable should have optical and electronic properties different from existing single-component cables of comparable size, says Yuegang Zhang of the NEC Corp. in Ibaraki, Japan. Zhang and his colleagues at Meijo University in Nagoya, Japan, and the University of Paris-South in Orsay, France, report their achievement in the Aug. 14 SCIENCE.

The team hasn't yet assessed the nanocable's ability to carry electricity, but Zhang says that the structures might find use in tiny circuits in computer chips. Depending on the materials used, such a wire could also emit light, he adds. —*C.W.*

Silver flashes red, yellow, and green

Tiny grains of silver glow in different colors depending on their size, a new study finds.

Last year, Shuming Nie and his colleagues at Indiana University in Bloomington discovered that bits of metal emit light when excited by a laser, but "in a typical population of particles, at most 1 percent are active," he says. Exploring this phenomenon further, the researchers examined individual silver particles with sensitive light detection techniques to understand how grain size correlates with optical properties.

They report in the Aug. 12 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY that 70- and 140-nanometer grains emit green and red light, respectively, when excited. Particles that shine yellow either fall in an intermediate size range, around 115 nm, or consist of green and red particles stuck together. If they could sort the particles by size, Nie says, scientists could use them as light emitters in, for example, miniature lasers. —*C.W.*

Environment

Keeping methyl bromide under wraps

U.S. farmers spend some $1 billion annually to inject plowed fields with the liquid pesticide methyl bromide. Lately, many of these growers have also been temporarily covering those fields with plastic sheets as soon as they're treated. The plastic is intended to keep the volatile compound in the ground, where it can protect crop roots, and out of the air, where it would contribute to depletion of Earth's stratospheric ozone (SN: 10/4/97, p. 223). New studies, however, suggest that this process falls far short of its intended purpose.

Methyl bromide kills crop pests from nematodes (parasitic roundworms) to fungi to weeds. Although nothing else comes close to offering farmers the same broad-spectrum protection for their crops, this chemical is slated to be phased out under the Clean Air Act by Jan. 1, 2001. Growers, however, have been working to get an eleventh-hour reprieve.

Farmers had hoped plastic tarps would keep the pesticide down on the farm and allow them to press for a change in the law. But methyl bromide seeps right through the high-density polyethylene plastic from which current tarps are made, explains soil physicist Dong Wang, who studies the problem at the Agriculture Department's U.S. Salinity Laboratory in Riverside, Calif.

Even an unbroken, multiacre blanket allows up to 75 percent of the fumigant to seep through, mostly within the first 5 days after application. If farmers cover only planted beds—leaving open furrows between rows—methyl bromide losses can reach 90 percent, Wang's team reports in the September ENVIRONMENTAL SCIENCE & TECHNOLOGY.

The researchers recently identified a better—albeit experimental—plastic known as Hytibar, which has a layer of impermeable polyvinyl alcohol sandwiched between two sheets of polyethylene. Such a blanket holds methyl bromide leaks to just 5 percent. However, Wang's latest data show that failing to cover furrows defeats Hytibar's benefits. The openings "act like windows," he says, letting 70 to 80 percent of the chemical escape.

Until something like Hytibar becomes commercially available, Wang suspects, U.S. growers may have to employ less effective alternative pesticides or accept higher crop-yield losses to common blights. —*J.R.*

Chernobyl linked to autoimmune disease

Children living immediately downwind of the April 1986 Chernobyl nuclear plant accident have developed autoimmune thyroid abnormalities at almost seven times the rate of those who lived upwind of the reactor's fallout, reports an international team of researchers in the Sept. 5 LANCET.

The thyroid collects radioactive iodine from nuclear fallout. An earlier study found an excess of thyroid cancers among children exposed to Chernobyl fallout (SN: 6/17/95, p. 381). In this study, Furio Pacini of the University of Pisa in Italy and his colleagues assayed for noncancerous thyroid disorders in children who were less than 13 years old at the time of the accident. Nearly 300 came from a village subjected to a heavy rain of fallout. Another 200 had been exposed to almost no radiation.

The group exposed to high levels of Chernobyl fallout had an unusually high incidence of antibodies to thyroid cells, suggesting that their immune systems were attacking the organ, Pacini's group notes. Among these children, the incidence was highest in girls at least 6 years old at the time of the accident. They were more than twice as likely to have the antibodies as were fallout-exposed boys of their age—and almost 10 times as likely as were girls their age from the unexposed town.

Some studies have suggested that high estrogen production increases a person's vulnerability to autoimmune disease. This might partially explain why fallout-exposed girls who, before the study, had undergone puberty faced the highest rate of autoimmune thyroid disease, Pacini says. —*J.R.*