

TECHNOLOGY

Flash filling for front teeth

The time pressure is off on dental fillings with a composite developed by Imperial Chemical Industries in the United Kingdom. No longer must the dentist rush to fill a difficult cavity or build up a chipped tooth before the filling material hardens. According to a report in the May 8 *CHEMICAL AND ENGINEERING NEWS*, the new blend, called Fotofil, remains a paste until its catalyst is activated by light from a special source "gun." The paste then cures within a minute to an inert structure, which matches the enamel of neighboring teeth.

The active component of the paste is a resin made of urethane dimethacrylate, a member of the family of materials used to coat chemical tanks. A barium-containing glass filler makes up 80 percent of the paste formulation. The glass is ground to particles of 10 microns and coated with a silicon compound.

The dental material is soon to be marketed in the United States for restoration of front teeth. Molars, however, require a substance highly resistant to abrasion. The developers are now investigating whether Fotofil or modifications with different glasses and resins are suitable for back teeth. Unlimited time for sculpturing molar work would be especially valuable because accurate shaping of molars prevents wear on the opposing teeth.

Sifting through the silicon

Finding a needle in a haystack is a difficult type of research problem, whether it involves trace impurities or basic constituents of chemical and biological systems. Researchers at Bell Telephone Laboratories report a new electron microscope technique for identifying and locating minute amounts of certain elements in diverse materials. So far, researchers have used it to identify a few hundred carbon atoms among several hundred billion silicon atoms, unwanted oxygen, nitrogen and carbon in integrated circuits and the storage site of the neurotransmitter serotonin in human blood platelets (reported in the May 5 *SCIENCE*).

The technique, called electron energy-loss spectroscopy, locates atoms of different elements by their interactions with a beam of electrons generated by the microscope. The beam electrons lose a characteristic amount of energy when they interact with each type of atom. David Joy and Dennis Maher then use a magnetic field to sort the beam atoms by amount of energy lost. In addition to detecting small amounts of elements, the technique allows scientists to measure distances between atoms to within a quarter of the diameter of one atom.

Roy Rogers to the delivery

Cows in labor may soon be calling cowboys, if the Federal Communications Commission approves a new device. A matchbook-size transmitter held in place by an adhesive signals when the cow's cervix dilates just before giving birth. The cowboy's receiver picks up the signal, which directs him to the bearing cow.

The reusable device, which has a range of 15 miles, was developed by Warren R. Jewett, Walter Evans and Lee Ingle of the University of Arizona. Bill Clevenger of Vita Vet, the company that plans to produce the detectors, estimates that 10 to 15 percent of unattended livestock births result in death to the newborn. Cattle and horses don't always take care of their new offspring or protect them from predators. The device will also be useful for zoo animals that often kill their newborns. Jewett's work on a birth signaling device began with an inquiry from the St. Louis Zoo. To save snow leopard cubs, zoo attendants need to be on hand to separate the cubs from their mother within 30 minutes of birth.

MAY 27, 1978

ENVIRONMENT

People pollution

Just breathing can make a room without ventilation that is also full of people pretty stuffy. How stuffy? Tsen C. Wang, a chemical engineer with Harbor Branch Foundation in Fort Pierce, Fla., rigged up a monitoring system to find out. Results, in the March *CHEMTECH*, showed elevated levels of carbon dioxide, carbon monoxide, alcohol, methane and acetone. Wang plotted accumulation and decay rates for CO₂ over time, and the steady-state contamination levels for each chemical based on the number of people in the room. Equations derived from the data permit fairly accurate predictions of necessary ventilation.

Asbestos pollution from auto brakes

Suspicion that automobile brakes released deformed "chrysotile" asbestos has been confirmed by Krishna Seshan, a materials science engineer at Lawrence Berkeley Laboratory in California. Most cars brake by grinding pads against a heat-resistant asbestos brake lining, Seshan says. His work shows that this deforms asbestos fibers, which are released as dust. And studies indicate that when asbestos is deformed, its surface electrical charge is altered, increasing its biological activity — and health risks, Seshan told *SCIENCE NEWS*. Asbestos has been linked with both lung disease and cancer in humans.

Deformed asbestos had been detected in air samples near highways, but scientists could not be sure where it originated. Seshan reasoned that highly deformed fibers probably came from autos, slightly deformed fibers from building-construction materials and undeformed fibers from natural rock. Since crystals "carry a memory" of their original structure despite later deformation, Seshan figured he might be able to correlate the degree of deformity with the fiber's source.

He examined brake-drum dust using dark field image electron microscopy (a way to observe small particles by looking at diffraction patterns of scattered electrons); the technique is common to microscopists, Seshan says, but relatively ignored by environmental scientists. Not only did he verify the presence of asbestos, but he also ascertained that fibers ranged from slightly to very deformed. He describes his work in the June *ENVIRONMENTAL RESEARCH*.

There is probably little risk to drivers because of the small amounts they would inhale, LBL says. Not so with mechanics; those who clean brakes using compressed air might inhale up to one million particles per cubic meter of air, LBL says.

Air pollution: More bad news

Results of a study conducted in Allegheny County, Pa., for the Environmental Protection Agency add weight to the theory that air pollution reduces life expectancy. Using statistical data for 1968 to 1972, John J. Gregor of Pennsylvania State University (now of Plymouth State College in New Hampshire) found that reducing total particulates one percent corresponded to a 0.23 to 0.89 percent reduction in pollution-related deaths. He cautions against extrapolating results to other regions, because it is not clear "whether the relatively large influence" of particulates on death rates is due to specific pollutants or to "inherent characteristics of particulate matter." For example, he found the correlation between sulfur dioxide — one of the particulate pollutants — and deaths was statistically insignificant.

The study, Intra-urban Mortality and Air Quality, also concludes that air pollution impacts increase with age, indicating either that the body's ability to counter effects decreases, or that pollutants have a cumulative effect. And although impact on both sexes is near equal after age 65, before 65 men show more adverse effects than women.

349