

technology notes

ANALYTICAL CHEMISTRY

Laser measures particle contamination

In some chemical experiments, small concentrations of solid particles suspended in liquids can upset measurements unless the exact concentration is known.

A new technique using laser light can measure contamination of a few hundred particles per cubic centimeter, or one part by weight of particles to a billion parts of the liquid. The method has been developed by Dr. David H. Freeman and Edwin C. Kuehner of the National Bureau of Standards.

The detector uses the principle that small particles, typically less than a thousandth of a centimeter in size, are a billion times more effective in scattering light than are the liquids in which they are suspended. The highly concentrated laser beam allows analysis to be made from a small sample of test liquid.

The laser beam is shined through the sample, and a photo detector is placed at right angles to the beam to pick up scattered light. The machine is calibrated by measuring the scattering from solutions of known concentrations.

The method should be useful in such fields as water and air pollution, medical and bacteriological research, particle-free lubrication, and microminiature electronics.

PROSPECTING

Fast neutrons locate gold

The artificial element californium 252 is being tested by the U.S. Geological Survey as a means of detecting small amounts of gold and silver in the earth, as well as exploring for ground water.

The heavy isotope, which doesn't exist in nature but has a half-life of nearly three years once it has been created, gives off large numbers of fast neutrons. Gold and silver, when struck by neutrons, give off characteristic patterns of beta and gamma radiation that can be analyzed by special detectors.

Neutron activation for mineral exploration has been developed for several years, but present detection units have to be carried in a truck, while the californium detector, with a hundred millionth of a gram of the rare element, is about the size of a pencil eraser.

Ground water studies also have been made using neutrons, which are slowed down by collision with nuclei of hydrogen atoms in the water. The large number of neutrons available from a very small californium source should increase accuracy, flexibility and economy.

TRANSPORTATION

Gasoline/electric truck

A six-wheeled Army vehicle able to haul two tons up a 60 percent grade has been developed by the Army and General Motors Delco-Remy Division.

The truck is powered by a gasoline engine but uses newly engineered brushless electric motors on each of its wheels. Each motor can be operated separately, and no

gear shifting is necessary. The truck can haul seven tons at 50 miles per hour on level ground.

CRYSTALLOGRAPHY

Protons reveal lattice structure

A microscope that uses a beam of protons to make detailed studies of fine crystal structure has been developed by engineers at the British Atomic Energy Authority.

In the microscope, the beam of protons bounced off a single crystal specimen, which can be only a few tens of atoms thick, is scattered according to the shape of the sample and shows up on a fluorescent screen.

The instrument provides a quick and simple way of orienting single crystals and studying the positions of impurity atoms in a single crystalline lattice.

LIQUID CRYSTALS

Electricity converted to color

Electrical signals are converted into colored patterns by a new technique using so-called liquid crystals, reports a Westinghouse engineer.

Liquid crystals are organic compounds, mostly cholesterol, that exist in a state of matter between liquid and solid forms. The molecules, though not held rigidly in place, keep a certain amount of alignment.

A film of liquid crystal has a color that depends on that alignment, which can be altered by temperature, pressure and electric fields.

By shining an electron beam, as in a TV receiver, on a screen of liquid crystals, J. R. Hansen of the Westinghouse Research Laboratories produced a pattern whose color varied according to the intensity of the beam.

A TV test pattern, reproduced on the liquid crystals, showed hues corresponding to shades of gray in the black and white display. The colors reproduced are not necessarily true-to-life, but could be useful in various displays such as X-ray, radar, on infrared scanners.

One problem with the system from a practical point of view is that the color patterns decay gradually. Research aimed at eliminating decay is now going on.

PAPER

Newsprint from the desert

A group of Mexican chemistry researchers, headed by Rafael Illescas Frisbie, reports that a type of desert yam—*Yuca brevifolia*—can become an inexhaustible source of cellulose for newsprint production if its cultivation is expanded.

"If this variety of yucca is planted extensively in Mexican desert areas," Illescas Frisbie says, "within two decades there would be no need to touch a single tree in Mexico's forests for wood pulp."

A rational and directed exploitation should produce enough cellulose for internal paper production needs, and provide sizeable amounts for export, chiefly within Latin America, he believes.