CHEMISTRY

HGMS: New carrier, expanded use

Purdue University researchers have combined a pinch of chemistry, a dash of engineering and some simple physics to devise a way to capture nonmagnetic particles from a liquid by magnetic means. The Lafayette, Ind., team, headed by Fritz J. Friedlaender, has developed a variation of the High Gradient Magnetic Separator (HGMS).

In the HGMS — first developed in the late 1960s at the Massachusetts Institute of Technology — particulate materials in a liquid carrier are passed through a steel wool matrix. The steel wool, placed in a magnetic field, attracts the magnetic material from the particulate mass. Now, Friedlaender and colleagues have developed a way to separate nonmagnetic particles by modifying the liquid carrier in the HGMS. Forces acting on the particles in a liquid depend on the difference between the magnetic properties of the particles and the liquid, rather than the absolute magnetic properties of these components. So, if the particles are nonmagnetic and the liquid is magnetic, for example, a difference in magnetic properties exists. And, "The difference between the properties of [liquid] carrier and particles causes the particles to be acted upon by the high gradient magnetic field," Friedlaender explains. As a result, nonmagnetic particles can be separated, or removed, by magnetic means.

Changing the magnetic property of the carrier by dissolving different substances in the liquid results in the selective filtering of particles passing through the HGMS, says Friedlaender, whose report on selective capture recently was accepted for publication in the JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS.

Moreover, the HGMS is a fairly inexpensive process in most situations. The separator already is being used to prepare clays for such industries as paper manufacturing, to treat wastewater from steel mills and to separate red blood cells from serum. HGMS also is being tested as a way to remove inorganic sulfur from coal before burning.

Friedlaender's variation of the HGMS may make possible the separation of alunite from alunite ores, which in turn could be used as a source of aluminum. Currently, aluminum is extracted in this country almost entirely from imported bauxite. The development of this application, however, will take years, Friedlaender predicts. "It's not a trivial matter to go from an idea to an economically feasible situation," he explains.

Here's marijuana in your eye?

Two organic chemists at Georgia Tech in Atlanta may soften the battle lines in the controversial use of marijuana (SN: 8/5/78, p. 94; 2/16/80, p. 103) in treating glaucoma, a disease of the eye characterized by increased pressure and impaired vision (SN: 5/20/78, p. 328).

The chemists, Howard Deutsch and Leon Zalkow, have discovered that a marijuana extract—one that does not contain the psychoactive tetrahydrocannabinol (THC) — still is effective in lowering intraocular pressure in the eyes of test rabbits. Moreover, this cannabis extract seems to be twice as effective as THC in lowering the glaucoma-related pressure.

Recently awarded a grant by the National Eye Institute, the two researchers now are attempting to isolate the compound responsible for the intraocular pressure-lowering activity of their extract. This detection process could end "next week or a year from now," Deutsch says. "You never know when you'll successfully isolate a compound and identify its structure."

Once Deutsch and Zalkow isolate the compound and subject it to further animal tests, they will turn it over to Keith Green of Medical College in Augusta, Ga., who will direct tests in humans. Marijuana-extract eye drops eventually may be developed for glaucoma patients.

BIOMEDICINE

Choline: The better to see you with

Nerves takes up choline, a chemical present in B vitamins, in order to make the neurotransmitter acetylcholine. Now photoreceptor cells in the retina (cells that provide the eye with the first steps of vision) have been found to accumulate choline, Richard H. Masland and John W. Mills of Harvard Medical School in Boston report in the March PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

However, the photoreceptor cells don't use the choline to make acetylcholine, Masland and Mills explain. Rather, the cells use choline to manufacture outer segments, the thin stacks of membranes clumped onto each photoreceptor cell that contain light-sensitive pigment molecules and initiate vision (SN: 6/25/77, p. 408). Each photoreceptor cell sheds and replaces hundreds of outer segments daily.

Oxidation and cataract formation

What is the molecular basis of cataract formation? Scientists aren't sure, but a study reported in the March PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES suggests that it may be extensive oxidation of proteins in the lens of the eye.

Margaret H. Garner and Abraham Spector of Columbia University College of Physicians and Surgeons in New York City have found that there is no oxidation of proteins in lenses from young persons, some oxidation in proteins in lenses from older healthy persons and dramatic oxidation of proteins in the lenses of cataract patients. "The data," they conclude, "clearly support the viewpoint that extensive oxidation of lens proteins occurs with cataract and that it begins at the lens fiber membrane."

Garner and Spector speculate that such oxidation is caused when lens enzymes that normally prevent it become defective. Or, they say, such oxidation may arise from light interactions with proteins in the lens. Normally, the lens probably has mechanisms for protecting proteins from photochemical damage; last year researchers found that vitamin C can protect the lens from certain types of photochemical oxidation damage.

New fighter against tooth decay

A chemical called acarbose significantly inhibits certain enzymes that help cavity-causing bacteria bind to teeth, Ernest Newbrun, professor of oral medicine at the University of California in San Francisco, reported at the recent annual meeting in Los Angeles of the American Association for Dental Research.

Newbrun will now attempt to see whether acarbose can actually keep cavity-causing bacteria from adhering to teeth. If so, then he'll determine whether acarbose can prevent tooth decay in animals and, if so, whether it also does the same in humans.

If acarbose is ever approved as a tooth decay preventative, it will probably be marketed as a mouthwash or a dentifrice.

Heart relief without hallucinations

Beta-adrenergic blockers, which modify nerve impulses that direct the beating of the heart, promise to be some of the most popular drugs for treating heart disease in the 1980s. However, these drugs sometimes cause undesirable central nervous system effects, such as nightmares, vivid dreams or even hallucinations.

Those beta blockers less able to pass through the brain's blood-brain barrier are less likely to cause such side effects, J.M. Cruickshank of ICI Ltd. in Macclesfield, Cheshire, England, and colleagues reported at a recent international symposium on beta blocker therapy in heart disease. The symposium was held at the University of Texas Health Science Center in Dallas.