Energy hopeful seeks greater visibility

Thermionic energy conversion is not a household phrase, even in energy circles. Proponents of the technology came to Washington last week in a campaign to change that, starting with the Congress.

The process involves heating an emitter plate of a nickel-based alloy until electrons are driven off; they travel through a near-vacuum gap, condensing on a collector plate. The movement of electrons creates an electric current. The long- and well-known process was originally developed to power electrical systems in long-mission space flights, but was never used. Now the Energy Department is concentrating on adapting it as a "topping cycle" to increase the overall efficiency of fossil-fired power plants from 35 or 40 percent to 50 or 55 percent.

Developers such as Thermo Electron Corp. of Waltham, Mass., and Rasor Associates of Sunnyvale, Calif., say the process has proved itself in years of tests. What remains is to adapt the engineering to modular systems that will be marketable by 1985. But the real problem is financial, supporters say; its lack of visibility as a near-term option for conserving energy has resulted in inadequate funding. □

Harmless swap mirrors gene damage

An interchange of genetic material that makes no difference to the cell can be a quick indicator of chemical damage to genes. The frequency of that DNA even-swap, called sister chromatid exchange (SCE), is linearly related to the rate of gene mutation after laboratory-grown hamster cells are exposed to mutation-causing chemicals, researchers at Lawrence Livermore Laboratory report. Looking for the exchange is much quicker than looking for mutations, says Tony Carrano. The results are available within 24 hours of chemical treatment, whereas looking directly at mutations takes 9 to 13 days.

Sister chromatids are replicated chromosomes that will be pulled apart during cell division. The researchers identify the younger sister by a tag component present during its formation. If the chromatids have broken, switched segments and healed, each sister will be partially tagged. A harlequin pattern of exchanged segments, after staining procedures, is easily visible with a microscope.

Carrano and colleagues Larry Thompson, Jay Minkler and Pat Lindl studied four chemicals that cause genetic changes in different ways. In each case the number of sister chromatid exchanges is proportional to the number of mutations observed. However, the ratio of exchanges per mutation is different for each chemical. The investigators estimate that in a cell with 50,000 genes, every sister chromatid exchange reflects 1.2 mutations with N-ethyl-N-nitrosourea (an alkylating agent), but only 0.08 mutations with mitomycin C (a cross-linking agent).

"The type of lesion produced by each chemical and the nature of its repair probably determine the relative frequency of induced SCE's and mutations," Carrano and co-workers suggest in the Feb. 9 NATURE. Thus, it will be necessary to establish the relative frequencies for each condition of interest. Further work will also be needed to show that relationships observed in cells growing in the laboratory apply to cells in the body. If so, this test applied to human and animal cells will be a valuable addition to the current short-term bacterial tests for mutagens. □

Court okays DNA risk experiments

On May 31, 1977, a lawyer filed a suit in behalf of his 2-year-old son against Department of Health, Education and Welfare officials. He sought a prohibition against experiments planned by the National Institutes of Health at Fort Detrick in Frederick, Md. Last week the judge denied the motion, and the research may begin in a few weeks.

The experiments in question are designed to examine one of the potential hazards of recombinant DNA research. While most scientists now agree there is an acceptably low risk that the intentionally enfeebled *Escherichia coli* K-12 widely used in experiments could escape from a laboratory and establish colonies, there is little evidence about whether recombinant DNA molecules could hop from the enfeebled bacteria to a hardier host. The probability of such a transfer would influence safety requirements for future DNA experiments.

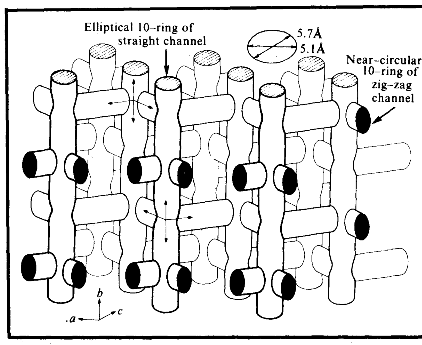
Ferdinand J. Mack, the plaintiff, stated that since the Fort Detrick experiments use genes from polyoma, a virus known to cause cancer in mice, even a minuscule quantity in the environment would be a threat to life and health. The defendants contend that the *E. coli* K-12 bacteria is specifically designed to self-destruct if it escapes and that the P4 laboratory includes features shown to safely contain hazardous microbes.

U.S. District Court Judge John Lewis Smith Jr. ruled that NIH complied with the National Environmental Policy Act by taking a "hard look" at environmental consequences of research conducted according to its guidelines. He states, "Recombinant DNA research has already become a valuable aid in progress against illness," and concludes that the risk assessment experiments pose no substantial risk to human health or environment. □

A sieve to strain organic molecules

A molecular sieve is a crystalline substance that can be used to strain particular chemical species out of a mixture. Molecular sieves are characterized by an openness of crystalline structure; they have holes or channels in which the substances to be removed are preferentially adsorbed. When the sieve crystals are pulled out of the mixture, the adsorbed substances go along.

Since 1949 several such substances, called aluminosilicate zeolites, have been developed. In the Feb. 9 NATURE E. M. Flanigen, J. M. Bennett, R. W. Grose, J. P. Cohen, R. L. Patton and R. M. Kirchner of the Union Carbide Corporation's Tarrytown Technical Center in Tarrytown, N.Y., and J. V. Smith of the University of Chicago announce the development of a new molecular sieve, silicalite, a form of silica (SiO_2).



Flanigen et al/Nature

Silicalite's channels trap organics.

Silicalite is particularly important because it is the first molecular sieve to show hydrophobic qualities.

Silicalite is made by crystallization in a closed system containing alkylammonium cations, hydroxyl ions and a reactive form of silica. The result is what the experimenters call a "new topologic type of tetrahedral framework." Each silicon atom is in the center of a tetrahedron of oxygen atoms. The oxygens at the corners of the tetrahedron link the silicon in the middle to other silicon atoms. This complex of interconnected tetrahedra results in a framework of five-sided rings of silicon atoms, which, in three dimensions forms an interlocking system of channels surrounded by rings of ten oxygens. In formation these channels have ammonium ions in them. The ammonium is driven off by heat, leaving silicate with an open structure of channels.

The resulting crystalline substance tends to repel water and to adsorb organic molecules. It can thus be used to remove organics from water. In principle it will take organic molecules up to 6 angstroms across. It has been tested with methanol, propanol, butanol, phenol, 1,4-dioxane, pentane and hexane. The developers suggest it will be useful for cleaning industrial waste water. □