Technology

A well-insulated look for windows

An inch-thick window that insulates as well as three inches of fiberglass batting is the goal of a research project at the Lawrence Berkeley Laboratory (LBL) in Berkeley, Calif. The window material that LBL researchers are beginning to investigate is a transparent, porous substance called an aerogel. A typical aerogel consists of a rigid network of tiny silica particles joined together in branched chains.

The trick to producing a suitable aerogel is careful drying of the jellylike, silica starting material. Silica gels allowed to dry at room temperature and pressure usually collapse or crumble. A better way is to use higher temperatures and pressures. Under these conditions, the liquid within the gel shifts into a phase that is neither liquid nor gas but something in between, and the fluid can escape from the gel without damaging its structure.

The researchers must overcome several significant problems before aerogels can be used for windows. Aerogels, although remarkably clear, scatter a small amount of blue light. Thus, an aerogel window itself looks bluish, while objects seen through such a window appear reddish. In addition, a typical aerogel is extremely fragile. Stephen Selkowitz, one of the project leaders, says, "You can crumble aerogel in your fingers." The best answer seems to be to form the aerogel between two thin sheets of glass. It also isn't clear yet whether aerogel windows, once the other problems are solved, can be produced economically on a large scale.

Selkowitz says, "We have a lot of work to do to find out just how much molding and shaping we can do and still produce good-quality aerogel, while at the same time incorporating any new techniques for minimizing scatter and improving insulation quality."

From nuclear fusion to synthetic veins

A plastic foam that was developed as a support material for tiny glass pellets used in laser-fusion experiments may prove to be useful as the stuff of synthetic veins for such things as heart bypass surgery. David Duchane of the Los Alamos National Laboratory in New Mexico says the foam is comparatively inexpensive to manufacture and more uniformly porous than many other materials now being tested for this purpose.The foam's tiny cells seem to prevent the buildup of scar tissue, he says, a problem often associated with synthetic transplants.

The plastic foam, however, isn't quite ready yet for surgical use because the material is still too rigid. Los Alamos researchers, led by Ainslie Young, are looking for a more flexible version of the foam. Nevertheless, other industrial applications are possible because this lightweight, delicate foam can be shaped by normal machining processes without damaging the tiny cells that make up the material. Young says the foam could provide a solid support for liquids, act as an efficient air filter or be used where a "breathable" plastic is needed.

A sound solution for fan noise

Gary Koopman of the University of Houston is using sound to subdue noise. By attaching a resonating column or cylinder to a fan's housing, he can reduce the fan's noise level by as much as 10 times. Air passing across the cylinder's open end generates a tone in the same way that blowing across a bottle's open end produces a sound. If this column is carefully tuned to match the main component of the fan's sound and if the tone produced is exactly out of phase with that component, then the sound waves will cancel each other out. This reduces the fan's noise level. Koopman's technique has already been applied to fans on diesel-powered street sweepers in West Berlin, and since then Koopman has developed resonators for large, electric power-plant fans.

Earth Sciences

New steam for magma energy study

A few years ago, researchers from Sandia National Laboratories in Albuquerque, N.M., demonstrated that it is possible to drill through magma—molten rock—and keep the hole open for extraction of geothermal energy (SN: 12/19/81, p. 392). But "possible" is not the same as "feasible" when it comes to the economic realities of putting an expensive and untried technology to work. Now, with funding from the U.S. Department of Energy, Sandia scientists are embarking on a new phase of their magma energy studies. James Kelsey, head of Sandia's Geothermal Technology Division, says that the research team now hopes to prove that the engineering capabilities can be applied cheaply enough to make magma energy commercially appealing to an energy production company. In the project, researchers will study ways to locate and select magma bodies for drilling, and will test materials and systems that can be used in drilling equipment that must function in magma, which can exceed 2,000°F. They also will select a preferred method for extracting heat from magma, using the heat to produce steam or gas that would power a standard turbo-electric generator on the surface.

Solutions to the problems of extracting energy from magma are complicated and expensive, but the potential of the resource makes it an enticing alternative to fossil fuels. The United States Geological Survey estimates that magma bodies within six miles of the earth's surface in the continental U.S. could supply 800 to 8,000 times the energy that the nation consumes each year. Sandia's project will focus on magma within three miles of the surface. The project will end in the late 1980s when engineers drill into a magma body and extract heat. Kelsey says possible sites for a test field operation include a location near Socorro, N.M., the Salton Sea in California, and Mammoth Lakes, Calif.

Microquakes shake geothermal system

Each time a new steam well is opened and operated at the Geysers geothermal area 80 miles north of San Francisco, clusters of microearthquakes begin, even where earthquakes had not been experienced previously. The Geysers area is an underground steam field from which 1,300 megawatts of electricity are generated for northern California. It is one of the most seismically active parts of California. About 10 microquakes greater than magnitude 0.5 occur there each day. Donna Eberhart Phillips and David H. Oppenheimer, both of the U. S. Geological Survey in Menlo Park, Calif., studied the records of earthquakes in the area. They report in the Feb. 10 JOURNAL OF GEOPHYSICAL RESEARCH that the earthquakes are related to steam production, but that they cannot be correlated with a specific cause, such as withdrawal of steam from the ground or injection of fluids. Oppenheimer says that the earthquakes appear to be part of a "steady state system" and that the seismicity is caused because the geothermal energy production is altering the prevailing stress in the region. "It will probably go on until [geothermal energy] production stops, then the system will readjust itself," he says. "Fortunately, it looks rather benign at this point."

Alvin moves to a new berth

The 20-year liaison between the Navy-owned research submarine *Alvin* and its tender vessel, *Lulu,* ended recently when the *Alvin* was moved to a new home, the research vessel *Atlantis II. Alvin* is famous for its part in the discovery and exploration of the deep-sea hydrothermal vents. The new arrangement will enable scientists to reach dive sites faster and further out to sea. The *Atlantis II,* owned and operated by the Woods Hole Oceanographic Institution, is newly overhauled and outfitted with a hydraulic A-frame for launching and recovering the sub. Now, the ship and the sub are bound for the Pacific Ocean via the Panama Canal, for a year and a half of scientific studies.