K-1211-(100)

Unfortunately, a knowledge of surface temperature is in itself not sufficient to predict the relative safety or hazard of human contact with a heated surface. It is well known, for example, that a metal surface is more likely to cause burns through its heat flow than a plastic surface, though both are of the same elevated temperature.

Therefore there has been a need for a definitive instrument to measure and indicate the temperature that would be experienced by someone *in contact* with a heated surface.

Louis A. Marzetta, an electronics engineer with the National Bureau of Standards has recently developed such a device, called a "thermesthesiometer," which consists of a cylindrical measuring probe similar to a human finger. The probe is connected to an electronic unit that gives a digital reading of the contact temperature in degrees C.

The end of the probe, designed to be pressed against the heated test surface, is made of silicone rubber; this material is resilient, as is human tissue; and its thermal properties also are close to those of human tissue.

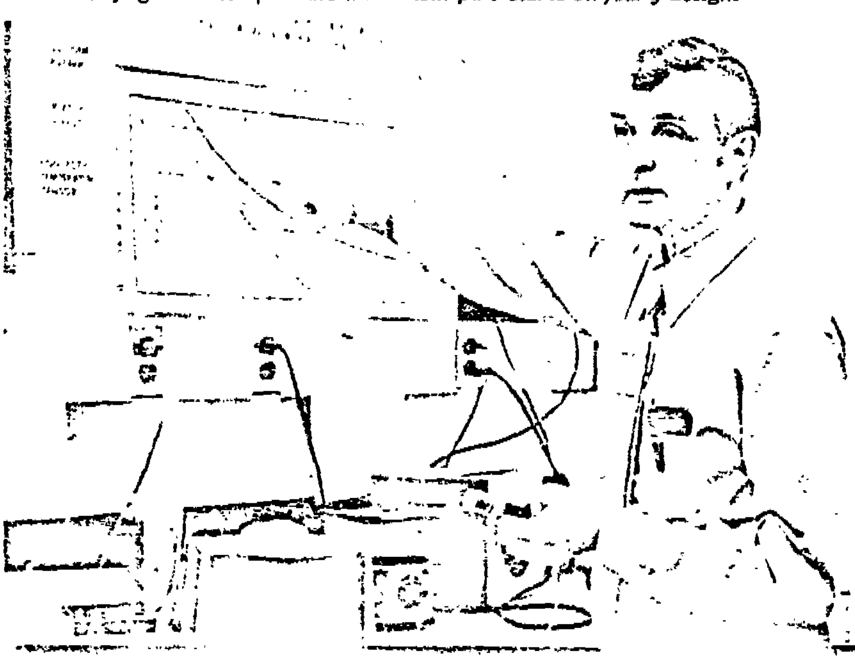
A heated wire, wound around an inner core tube keeps the probe assembly at 33 C—the temperature of a finger, and a resistance thermometer transducer inside the core tube acts as the heat sensor.

Obviously, damage to tissue from a heated surface is a function not only of the surface temperature, but also the length of time the tissue is in contact with the surface. To duplicate this time factor, the thermesthesiometer contains an adjustable circuit that allows measurements for contact periods of 1, 2, 4, or 8 seconds. The measuring time is started automatically upon thermal contact, and "frozen" at the interval end.

Although no instrument maker, as yet, manufactures the thermesthesiometer, NBS officials report, a market potential exists for it. This market should develop quickly if the unit is used by the Consumer Product Safety Commission as a basis for safety criteria and regulation. □

POINTING OUT A NEW WAY TO IMPROVE BURN SAFETY

finger-like temperature instrument puts blame on faulty designs



keeping a sharp lookout on vinyl chloride

SOUTH NORWALK, CONN.—Six months ago the New Year entered with a host of problems—most of which were expected. But one particular problem not only was unexpected, but was deadly also.

In January, officials at B.F. Goodrich Chemical Co.'s Louisville, Ky. plant reported that four workers had died of an extremely rare liver cancer, angiosarcoma. All had been involved in the plant's main activity: converting vinyl chloride monomer to polyvinyl chloride—the industrial chemical widely used in plastic pipes, floor tiles, phonograph records, and countless other products.

Then, in February, the company lost two more workers, again from angiosarcoma, bringing the total to six. Previously, the nationwide occurance was thought to be less than 30 cases a year.

Thus, such regulatory agencies as the National Institute of Occupational Safety & Health (NIOSH) and the Occupational Safety & Health Administration (OSHA) quickly rushed into the picture, as did the employes' unions, and many of the 23 U.S. VCM/PVC manufacturers, who employ some 6,500 persons at 37 plants.

Much of the resulting debate centered around the limits set for safety. The previous level had been 500 ppm vinyl chloride in the atmosphere. Union officials urged an immediate 95% emergency reduction to 50 ppm. Several firms, however, argued that more time should be taken to investigate the problem and that controls should be set by ordinary (and sometimes lengthy) rulemaking procedures.

Nonetheless, under strong union pressure, NIOSH urged the Labor Dept. to quickly issue rules requiring a "closed system" for VCM manufacture and processing, environment monitoring around VCM/PVC plants, as well as periodic employe medical tests. These proposals, however, included no mention of safe exposure limits.

> Terre Haute, Ind.—A tank car containing the controversial chemical vinyl chloride overturned here last March 17, allowing vapors to escape through a 15 x 31-cm opening. The tank car, owned by the Pennsylvania Central Railroad, was lined with lead wool and "Neoprene," and it was thought that none of the liquid escaped.
>
> Nevertheless, residents were evacuated over a 15-block area as a "precautionary" measure, reports the Smithsonain Institution Center for Short-Lived Phenomena (Cambridge, Mass.). The residents were allowed to return to their homes the following day. □

To their credit, B. F. Goodrich voluntarily limited their safe level to less than 50 ppm, as did several other manufacturers. (As of this writing, laboratory mice and rats have developed angiosarcoma from breathing VCM vapors in varying amounts from 200 to 2,500 ppm, but not yet at 50 ppm. Dr. Cesare Maltoni of the Instituto Di Oncologia, Bologna, Italy, is concentrating now on that 50-ppm level in MCA-sponsored tests.)

Not all firms were as concerned as B. F. Goodrich and others, who voluntarily limited exposure levels. In a March 1974 survey of five VCM and two PVC plants in the New Orleans-Baton Rouge, La., area, OSHA judged control measures to be "inadequate," and that actual exposure to the chemicals was generally unknown.

Finally, in mid-April, OSHA published in the *Federal Register* an emergency temporary ceiling of 50 ppm affecting all companies making the monomer or polymerizing it. And the permanent standard, it has been rumored, may be set as low as 1 ppm.

To measure the actual concentration, NIOSH has reportedly urged OSHA to require usage of a gas chromatograph coupled with a sample-collecting tube. Industry spokesmen, however, have criticized that method as being expensive and not providing real-time analysis. There are other techniques, it should be noted, that may be better suited for VCM monitoring. One of these is infrared spectroscopy.

Officials at Wilks Scientific Co.

CLOSE WATCH ON VINYL CHLORIDE
infrared gas analyzer detects at 1 ppm

here discussed with *Industrial Research* how typical low-level VCM monitoring can be handled with IR techniques. Says Terry F. Sinclair, "Vinyl chloride concentrations less than 100 ppm can be analyzed easily using our 'MIRAN I' Portable Gas Analyzer. This is a single-beam spectrometer equipped with a unique variable-pathlength gas cell. The vinyl chloride absorption bands at 6.15, 9.8, 10.9, and 13.9 μm are considered in quantitative analysis, and minimum detectable concentrations are usually found to be less than 1 ppm."

The choice of bands depends upon other chemicals present, as some 20 different chemicals are commonly found in VCM use or processing. Thus, if the environment contains ethylene, Freon-11, perchloroethylene, and vinylidine chloride, in addition to vinyl chloride, the 13.9 μm band will be found free from interference.

Says Sinclair, "A major strength of the IR method is that, should there be interference from extraneous chemicals (such as Freon-113, which interferes slightly at 13.9 μm), it would still be safe to do the analysis. Concentrations in excess of the ceiling limit will always give absorbances above the limit value, and once the contaminant is known, it is relatively easy to subtract its spectrum."

Infrared gas spectroscopy is suitable, for area (atmosphere) surveys, leak detection, and general VCM compliance testing. In addition there are systems available to monitor 6, 12, 24, or more remote points, such as the MIRAN II, which can handle samples from distances approaching 60 meters (200 ft). □

COSMOLOGY

life on Mars may be underground

McMurdo Station, Antartica—A recent discovery that 10,000-year old frozen bacteria can be thawed out and revived may have important implications in the search for life on Mars.

This conclusion is based on research performed by a U.S.-Japan-New Zealand drilling team studying the frozen continent's geologic history. The team members, being concerned about the fragile antartic environment, routinely made checks that no microorganisms from the drilling team ended up in the rocks. Biologists in the project took samples of deep rock cores drilled up, and added them to nutrient solutions designed to encourage bacteria growth.

A solution prepared with rocks drilled from a 120-meter depth here showed obvious signs of bacterial life. Frank Morelli of the Jet Propulsion Laboratory (Pasadena, Cal.) and the Darwin Research Institute of Dana Point, Cal., initially suspected that the bacteria represented the type of contamination that project scientists were trying to avoid. However, checks made of microorganisms around the drilling site and laboratory showed the cultured bacteria from the deep cores were not from these sources.

Morelli then ran four extra checks on the cores, each time producing the same unidentified bacteria. Then, deeper cores from the same site produced slightly different bacteria strains—also unidentified—and cores collected by Morelli's colleague, Roy Cameron, from another site 96-km away produced cultured bacteria colonies that actually reproduced.

The two scientists were thus forced to conclude that the bacteria were native to the cores, which are dated geologically as being between 10,000 and 1,000,000 years old. Plainly, the microorganisms had survived in a freeze-dried form in the rocks all these years, and had then been revived by warmth and the nutrient solution.

Among the factors that kept the bacteria alive for thousands of years longer than any creatures previously identified, suggests Cameron, were their small size and high concentration, and the low temperature of the ice-pocked antartic rocks.

Cameron and Morelli point out that their discovery has important implications in the search for life on other planets, especially Mars, which in some ways resembles Antartica. If the Viking mission, designed to land instruments on the red planet in 1976, fails to detect life on the surface, Cameron notes, scientists may well speculate that "the surface permafrost of that planet may hold the key to ancient—and living—biota deep within it." □

MATERIALS

depositing a cheap, superhard coating

Los Angeles—A new material has been discovered that is second in hardness only to diamond—and it can be produced relatively easily and cheaply.

The superhard material is made of titanium carbide, formed in thin layers through vapor deposition. Described as "easily the most startling material development in recent years," the new titanium carbide material promises to have a wide range of uses in cutting, grinding, and wear-resistant applications.

Dr. Rointan F. Bunshah, inventor of the material and a UCLA engineering professor, believes that titanium carbide can be produced at one-hundredth to one-thousandth the cost of various commercial grades of synthetic diamonds.

In the forming process, titanium metal atoms are vaporized by an electric beam in a vacuum chamber. A hydrocarbon gas is then injected into the chamber and the reaction forms titanium carbide.

The newly-formed vapor is then condensed and deposited at desired rates and degrees of hardness. De-