CHEMISTRY

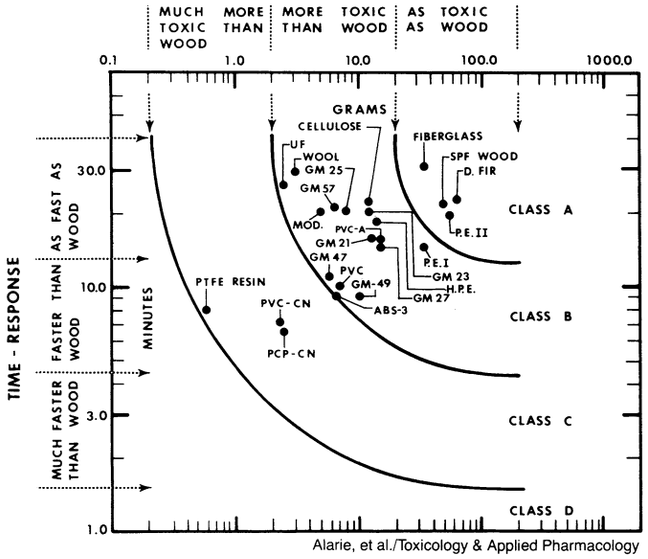
Plastic fire drills

Yves Alarie and Rosalind C. Anderson set the plastic world on fire. They have studied the behavior of various household and industrial polymers in fire and classified them according to the amount of toxic fumes they emitted. The classification, published in the February TOXICOLOGY AND APPLIED PHARMACOLOGY, "should be useful for selection of materials in various applications," report Alarie of the University of Pittsburgh and Anderson, now of the Arthur D. Little Co. in Cambridge, Mass.

The classification is based on experiments using mice in chambers that receive controlled amounts of smoke from burning samples of polymers. The results are plotted on a special concentration-response graph on which each tested polymer is represented by a point: For instance, PTFE RESIN is Teflon, PVC-CN is the polyvinylchloride material used in wallpapers and to coat electrical cables, UF is the popular insulating material urea formaldehyde and the GMs are the polyurethanes used in airplane interiors and furniture cushions. The horizontal axis of the graph denotes the gram-amount of the material needed to produce enough smoke to kill 50 percent of the test mice, and the Y axis indicates the time required for that amount of material to cause those fatalities. For example, 22 minutes of 63.8 grams of burning Douglas Fir (D. FIR) — the standard reference material — is required for the 50 percent kill.

Teflon, on the other hand, achieves the 50 percent effect in much less time (8 minutes) and with less material (.64 grams). Alarie says that while the heat of stove flames is never high enough to decompose Teflon to toxic fumes, the heat of house fires is. Urea formaldehyde, polyvinylchloride and polyurethanes also could release hazardous fumes in a fire.

The results of the fire research — funded in part by the National Bureau of Standards — are being relayed to appropriate regulatory agencies such as the Consumer Product Safety Commission and the Federal Aviation Administration. "I don't know if we are going to see regulations soon as a result of this research," Alarie says. "Of couse, in light of the recent Las Vegas fires [the major ones being the Nov. 21 MGM Grand Hotel and the Feb. 10 Las Vegas Hilton blazes] and the recent one in Ireland [the Feb. 14 Dublin discotheque blaze that reportedly spread quickly across the club's polystyrene-tiled ceiling], there may be a bit more pressure to look more closely at the toxicity of burning plastics." Says Alarie, "The MGM fire was a plastic fire: The 84 people that died did not burn to death; they died from the smoke emitted from the plastics."



Alarie, et al./Toxicology & Applied Pharmacology

ENVIRONMENT

Downtrend resumes in quality of life

For the first time in five years, none of the seven indices surveyed by the National Wildlife Federation to plot its annual Environmental Quality Index showed any improvement. Four indicators — water, wildlife, living space and soil — actually declined. And only air quality is better today than when NWF made its first EQI survey in 1970, the organization reports. Unlike last year's survey — showing virtually no change — the new EQI shows a renewed downward trend. NWF bills its index as an estimate of the quality of life in the United States as based on a combination of objective measurements and the subjective judgments of its staff in consultation with experts.

New perspective on air pollution

In 1977, E. Seskin and L. Lave analyzed a mountain of data collected nationally (SN: 1/14/78, p. 21), and from it derived computer models indicating that a 50 percent cut in air pollution nationally would lead to a 4.7 percent reduction in mortality (all other things remaining constant). Now Diane Gibbons and Gary McDonald, mathematicians with the General Motors Research Laboratories, have reworked the data and come up with a startlingly different conclusion: a 50 percent reduction in pollution would only drop mortality by 0.43 percent.

The GMR pair started with the same variables as Seskin and Lave, but added others considered but not factored into the Seskin-Lave analysis. Using a different mix of mathematical techniques than did Seskin and Lave, the GMR team found that none of the six air-pollution variables used in the earlier analysis — measures of sulfate and particulates from fixed industrial sources — entered into their equations. "On the basis of our analysis," says McDonald, "these air-pollution indices are not a significant factor in explaining mortality rate variations."

Worrisome chemical breakthroughs

Most materials currently used to make garments for protecting workers from exposure to dangerous chemicals appear inadequate for use with liquid halogenated ethanes and PCB's (polychlorinated biphenyls), according to a study about to be published by the National Institute of Occupational Safety and Health. R. W. Weeks and M. J. McLeod of Los Alamos National Laboratories say they undertook the investigation for NIOSH because of "the widespread use and hazardous or potentially carcinogenic nature" of the chemicals. Tens of millions of pounds of the substances are used in U.S. industry annually.

The study tested three different haloethanes and a PCB to measure how quickly they permeated each of 13 different commercially available and "widely accepted" materials used in making protective gloves, aprons and other garments. And their results, the authors say, show that the materials "are generally unsatisfactory for worker protection" against the haloethanes 1,2-dichloroethane; 1,1,1-trichloroethane; 1,1,2-trichloroethane, and Arochlor 1254 (a PCB). They add that the materials tested are also unlikely to provide satisfactory protection against other haloethanes or PCB's.

In some cases, breakthrough of a chemical occurred in just two or three minutes. Only polyvinyl alcohol, Teflon and Viton elastomer appreciably resisted breakthrough by the tested chemicals. But because polyvinyl alcohol reacts with moisture and Teflon crumples easily (degrading its protective qualities), the pair claim that of the tested materials, "only Viton appears to be capable of affording adequate worker protection." But there's a caveat: Though materials performing poorly in the lab may be expected to perform poorly in the workplace, the authors say the converse is not necessarily true.