

This volume results from a workshop held in Ottawa, Canada, in August 1984, that explored the predictive value of small-scale *in vivo* studies in characterizing the toxicity of chemicals of interest, both from a public health and an ecological viewpoint. This report from the Scientific Committee on Problems of the Environment (SCOPE) represents the consensus from that workshop. The first six chapters, of approximately 60 pages, are devoted to relatively short reports by the various workgroups at the SCOPE conference. The chapters cover general conclusions and recommendations; non-specialized mammalian cell cultures for toxicity testing; detection of toxic effects in specific mammalian organs and physiological systems; methods to predict toxicity, mostly by quantitative structure-activity relationships (QSAR); and short-term tests in ecotoxicology. The general conclusions were that short term tests provide much information but cannot yet replace long term animal tests as a basis for safety judgment; *in vitro* tests for acute, local effects should be developed, but chronic effects are unlikely to be detected using *in vitro* tests. The specific limitations of the short term tests are discussed in the respective chapters and recommendations are made where further research or even greater cooperation between governments, industry and private organizations would enhance the data base on which QSAR could be strengthened.

The remainder of this book is devoted to individual chapters by various authors, covering conceptual approaches to the development of methodology for short term tests; toxicity tests with mammalian cell cultures; the gastrointestinal tract and short term toxicity; specific organ/system toxicity using liver cells; developing kidney cells in toxicity tests; skin cells in predictive tests; use of hematopoietic cell renewal systems; short term tests for neurotoxicity, effects of chemicals on the endocrine system and on the immune system; reproductive and developmental dysfunction; ecotoxicologic testing; predicting safe levels of chemicals; and computer-aided techniques. Each chapter has extensive references, discusses the background and limitations of the specific test systems, and provides, to some degree, a view toward future trends. The major drawback of the book is that it was published five years late. Nevertheless, it appears to be a valuable compendium of available information on short term tests and their place in the armamentarium of toxicity tests.

E. WEISBURGER

*Fire and Polymers: Hazards Identification and Prevention*, by Gordon L. Nelson (Ed.), ACS Symposium Series, 425, American Chemical Society, Washington, DC, 1990, ISBN 0-8412-1779-3, 627 pp., \$ 99.95.

Fire continues to be a serious problem in society. 6,200 deaths, 30,000 injuries and \$ 8 billion in lost property occur annually, to which plastic or polymers

in various forms and combinations contribute. Many fires involve the combustion of polymeric materials, and although it has been recognized in some circles, relatively little publicity or public awareness has been given to investigations and research in this field. This book reflects the papers given during a symposium at the Dallas American Chemical Society (ACS) meeting in April 1989 and doubtlessly will become a classic milestone in this field.

The book is divided into five major sections.

In the fire toxicity section, six papers discuss the basic toxic aspects and effects of fire smoke using the N-gas method to integrate the effects of more than one combustion gas; the role of hydrogen chloride from chlorine-containing polymers such as PVC and others; of hydrogen cyanide (often overlooked but more potent and faster acting on humans than CO from nitrogen-containing polymers); of the particulate matter associated with combustion and its particle size, such as soot and chemical reaction products like metallic oxides or ozonolysis products); the chemical analysis of fire effluents (including oxygen, carbon monoxide, carbon dioxide, hydrogen chloride, hydrogen cyanide and oxides of nitrogen); and a review with details of toxic hazard and its effects on fire science (a scenario of a real world household emergency).

The second section on fire retardants and fire-resistant commodity plastics contain nine papers detailing the attempts over centuries to improve fire resistance, starting with a chapter on the history of control of polymer flammability. Promising new technology is discussed both by the addition of chemicals and by blending or co-polymerization to change or inhibit their burning effects. A discussion of ternary reactions among polymer substrates, organohalogens and metal oxides in the condensed phase under pyrolytic conditions follows with a novel system for the application of bromide in flame-retarding polymers using ammonium bromide. A discussion of flame-retardant latices for non-woven products, zinc borate as a flame retardant, smoke suppressant and afterglow suppressant in polymers (using Firebrake ZB), the design of flame retardants (cross-linking as a means to impact an increased thermal stability), and inorganic tin compounds as flame, smoke and CO suppressants, is followed by the mechanism of thermal degradation of fire-retardant melamine salts.

The third major section is concerned with Fire Retardancy in Engineering Plastics, and includes papers on fire resistance in advanced engineering thermoplastics to be used as structural components or to replace metals. Brominated phosphate ester flame retardants are then discussed, followed by details of polymers with improved flammability characteristics, a discussion of char formation in aromatic engineering polymers and the effects of coatings on the fire performance of plastics. Finally the section closes with a paper on synergistic fire performance between a zinc coating and a modified poly(phenylene oxide) substrate.

The fourth major section involves Fire and Cellulosics, a topic of real world immediate significance. First, the effect of crystallinity and additives on the

thermal degradation of cellulose is discussed, followed by the influences of oxygen chemisorption and of metal ions in the ignition and combustion of wood. Spontaneous heating, or the rate of isothermal heat evolution of lignocellulosic sheet materials in an air stream, is another paper, followed by the heat release from wood wall assemblies using the oxygen consumption method. The self-heating of lignocellulosic materials is another paper, as is the use of highly stabilized high-expansion foams in fighting forest fires.

The final section of the book deals with fire performance, testing and risk. It starts with the general principles of fire hazard and the role of smoke toxicity. The harmonization of fire testing in the European Community (scheduled for 1992) is presented, followed by the recent British regulations for upholstered furniture as it involves combustion-modified polyurethane foam. Heat release equipment to measure smoke is another paper, as is flammability characteristics of fiber-reinforced composite materials. Room fires and combustible linings, followed by fire hazards in a room due to a fire starting in a plenum, showing the effect of PVC wire coating, concludes the book.

The book is well referenced, and carefully indexed. It should be of much interest to polymer chemists, fire administrators, regulators and anyone involved in chemical health and safety in the real world. The editor and authors are to be commended for an outstanding book.

HOWARD H. FAWCETT

*Out of Control*, by Ralph Nader (narrator), available for purchase from Oil, Chemical and Atomic Workers, PO Box 2812, Denver, CO 80201, 32 min  $\frac{1}{2}$  in. VCR tape, price on request.

A series of serious incidents in the petrochemical industry since 1984, including one on October 23, 1989 which resulted in 23 fatalities and 272 injuries, with particles of iron falling over a 6-mile radius, prompted a number of investigations. One, by the John Gray Institute, documents a study of safety and health practices as they pertain to the Reliance Upon Contractors in Selected Petrochemical Industries (April 20, 1990), prompted the production of this tape. The Oil, Chemical and Atomic Workers International, whose 100,000 members constitute the major manpower resource, reviewed and summarized the findings in a dramatic fashion, finding that the use of outside 'contract' employees with only limited training or expertise, was an important factor in many of these serious incidents.

The tape is a combination of personal statements by employees of several major oil refineries, supplemented by engineering and economic input, superimposed on fire and explosion views to highlight the problem. The tape stresses that the complex intricate nature of plant equipment requires intimate knowl-