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Academician Nikolai Markovich EMANUEL'

Academician Nikolai Markovich Emanuel', an outstanding Soviet scientist, a major scientific organiser, member of the Praesidium of the USSR Academy of Sciences, Academician-Secretary of the Division of General and Technical Chemistry of the USSR Academy of Sciences, Principal Editor of the journal Uspekhi Khimii (Russian Chemical Reviews), Hero of Socialist Labour, and Laureate of the Lenin and State Prizes, died on 8th December, 1984, in his 70th year.

His entire scientific career has been associated with the Institute of Chemical Physics of the USSR Academy of Sciences and he was one of the founders of the Institute.

Fundamental advances in the theory of degenerate branched chain reactions and particularly liquid-phase oxidation processes, the stabilisation of polymers, the kinetics and mechanisms of important biological processes, and the creation of fundamentally new medicinal drugs are associated with Emanuel''s name. All these fields have developed successfully in the Sector of the Kinetics of Chemical and Biological Processes of the Institute of Chemistry of the USSR Academy

of Sciences which was established by Emanuel' and of which he remained the Head to the end of his life.

Emanuel' carried out important studies on the experimental justification of the general theory of chain reactions and he was one of the initiators of a new field—the study of the detailed chemical mechanisms of chain reactions, the identification of stable products, atoms, and free radicals, and the determination of their concentrations and reactivities. He discovered the new phenomenon of the subdivision of a complex chain process into macroscopic stages and demonstrated the possibility, in principle, of controlling a chemical process by acting on each stage separately.

The researches into the kinetics and mechanisms of reactions involving the liquid-phase oxidation of organic substances, carried out under Emanuel"s supervision, have received world recognition. The chain theory of liquid-phase oxidation has been created and justified experimentally. Kinetic equations have been obtained for the oxidation reactions of hydrocarbons of different classes. General mechanisms have been devised for the autocatalytic, catalytic, and inhibited oxidation and numerous specific instances have been studied experimentally. The phenomenon of the radical interaction of inhibitors, which constitutes the basis of the synergistic action of inhibiting compositions, has been discovered. New principles governing the acceleration of the oxidation reactions of hydrocarbons and liquefied hydrocarbon gases close to critical temperatures and pressures have been developed. Coupled chain oxidation reactions have been investigated and novel technological processes have been proposed for the oxidation of butane to acetic acid and ethyl methyl ketone, for the oxidation of olefins to epoxides, and for the liquid-phase oxidation of sulphur dioxide. A theory of the action of catalysts in liquid-phase oxidation reactions has been developed.

Since 1966, Emanuel' was Head of Research into the chemical physics of polymer ageing and stabilisation processes, a problem which has acquired particular importance in the national economy in connection with the vigorous development of the industrial production of polymeric materials. A large scientific centre, concerned with the problems of the ageing and stabilisation of polymers and engaged in broad scientific and technological relations both in the USSR and abroad, was created at the Institute of Chemical Physics of the USSR Academy of Sciences under his supervision. Numerous studies have been carried out on the kinetics and mechanisms of the inhibited and non-inhibited thermal oxidation of polymers of different classes as well as the photochemical oxidation and degradation of polymers in liquid and gaseous corrosive media and new effective stabilisers have been developed. The marked influence of the molecular dynamics of macromolecules on the reactivity of solid polymers has been observed. A new field, namely that concerned with the prediction of the useful life of articles made of polymeric materials, has been developing successfully. Many of the scientific developments have found extensive applications in industry.

Emanuel' initiated and directed a novel research field in physicochemical biology based on the application of physical and chemical kinetic methods to the study of various biological processes. Ideas concerning the role of free-radical processes in the growth of tumours, in radiation damage, and other pathological states have been developed. The important role of the inhibitors of free-radical reactions, namely antioxidants, as anticarcinogenic and anticancer agents, photo- and radio-protectors, and geroprotectors has been established. The kinetics of the development of many tumour processes in animals and man have been studied and quantitative criteria for the selection of highly effective anticancer preparations have been developed. Emanuel' proposed and studied comprehensively a series of new active medicinal preparations, two of which are already being manufactured by the medical industry and are widely used in clinical practice.

Emanuel' has made great contributions to the training of scientific cadres and he founded a large school concerned with the kinetics of chemical and biological processes, his [former] students including an Academician, Corresponding Members of the Academy of Sciences, and more than 50 doctors and 300 Candidates [holders of the equivalent of the Ph.D. degree] of Science. For many years he was a Professor at Moscow University. He published 15 monographs, among which his "Textbook of Chemical Kinetics" has received general recognition.

Emanuel"s contribution to the development of chemical science has gained broad international recognition. He was a member of the Academies of Sciences of the German Democratic Republic, Hungary, Poland, and Sweden, the New York Academy of Sciences, as well as a series of scientific societies. He has been awarded honorary doctorates by a number of foreign universities.

For his great contribution to the development of Soviet science, Emanuel' was awarded the title of Hero of Socialist Labour and a number of orders and medals. He was granted the Lenin and State Prizes as well as the Prize of the Council of Ministers of the USSR.

The bright memory of Nikolai Markovich Emanuel', a talented scientist, a sensitive teacher, and a charming human being, will forever remain in our hearts.

The Editorial Board