Vol. 3, No 2, 2009 History

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PROFESSOR MARK DAVYDOVICH GOLDFEIN. FIFTY YEARS IN SCIENCE

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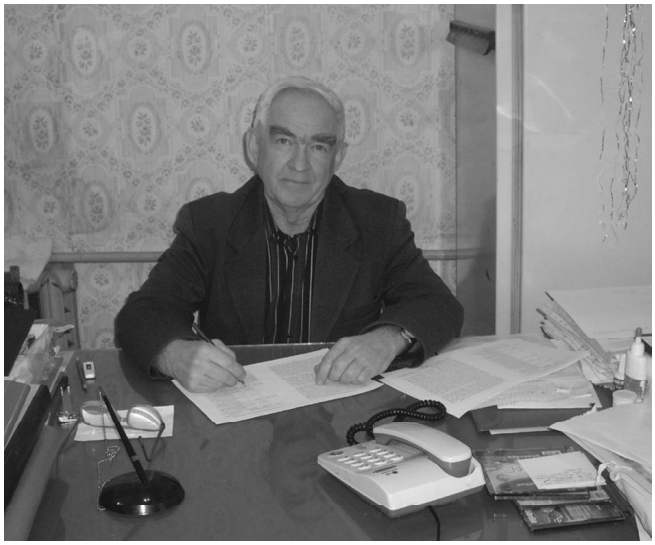
Doctor of Chemical Sciences, Professor Mark D. Goldfein was born on July 24, 1939 in Saratov (Soviet Union). For many years he has been the scientific supervisor of the laboratory of chemical physics and the head of the chair of environment protection and life safety at Saratov State University (Russian Federation). His basic researches were devoted to the kinetics and mechanism of liquid-phase radical polymerization of vinyl monomers. His fundamental results in this field are numerous studies on the gross kinetics, establishment of elementary reaction mechanisms of chain nucleation, growth, and breakage, determination of monomer reactivity parameters, new initiators and inhibitors for the conditions of homo- and copolymerization in bulk, in solution and in emulsion in the presence or absence of oxygen. The applied importance of his research consists in the development of effective polymerization regulation methods at initial stages and deep conversion degrees. These techniques have been used in polymeric industry: in monomer synthesis, processing, and storage, for production of polyacrylonitrile fibres and (met) acrylic dispersions, for synthesis of a high-molecular-weight flocculant and a rigid foam polyurethane.



The kinetics and mechanism of acrylonitrile polymerization and copolymerization of multicomponent monomeric acrylonitrile-based systems in aqueous solutions of sodium sulphocyanate were studied. The found rate constants of the elementary reactions, copolymerization constants, molecular weight, and structure of the copolymer in water-salt solutions essentially differ from the kinetic parameters of polymerization in organic solvents. The mechanism of the sodium sulphocyanate influence is caused by complex formation of monomer molecules and macroradicals with the ions in water-salt solutions.

His works related to studying of inhibited polymerization occupy a significant place in M. Goldfein's research. In this respect it is necessary to note the studies of the effects of a large number of stable mono- and polyradicals of a nitroxylic type. The efficiency of imino oxides as free radical acceptors has stimulated their application for studies of the mechanism of action of new polymerization initiators. Nitroxyls have been found to react only with some of the radicals formed at azonitrile disintegration, while at peroxide initiation they do not react with primary radicals. The observed regeneration of the inhibitor occurs as a result of detachment of a hydrogen atom from an iminoxyl by an active radical and is accompanied by formation of the appropriate nitroso compound. The nitroso compound inhibition mechanism consists in attachment of a growing chain to a -N=O fragment to form a stable radical. The interaction of iminoxyls with peroxides is determined by the solvent's nature, and the reaction of aromatic nitroxyls with them results in formation of non-radical compounds. At thermooxidative polymerization inhibition, kinetic effects were found to be caused by degenerative branching of the chain on polymeric peroxides and hydroperoxides, and by the inhibitor's critical concentration, above which a sharp increase of the induction period and a decrease of the stationary polymerization rate were observed. In the presence of sulfuric acid the polyperoxide disintegration is accelerated, and the critical phenomena are expressed more brightly. New kinetic equations to provide for such

effects as chain originating on inhibitor molecules, secondary inhibition, chain regeneration, and inhibitor regeneration have been derived; basic reactivity characteristics of all the inhibitors under study have been determined.

In the studies of the kinetics and mechanism of emulsion homo- and copolymerization of (met) acrylates it has been revealed that, unlike the common (classical) knowledge: (i) the kinetic orders by initiator and emulsifier are not characteristic of specific monomer systems and depend on the process conditions (which affect the ratio of various mechanisms of originating and growth of polymeric-monomeric particles); (ii) due account of bimolecular breakage of oligomeric radicals in the aqueous phase is necessary; (iii) the specificity of the mechanisms of chain originating, growth, and breakage in emulsion, and formation of latex particles are caused by monomer solubility, their intermixing, and the aqueous phase influence.

Lately, Professor M. Goldfein's research interests have been associated with the problems of environment protection and life safety. First of all this concerns his studies of synthesis features of polymeric dispersions with no emulsifiers specially introduced into the reactionary mixture, which are surfactants and, as a rule, harmful to living organisms. With this purpose, scientific basics of a synthesis technology of stable emulsifier-free latexes have been developed. In connection with the necessity of sharp reduction of the usage of chlorofluorocarbons destroying the ozone layer of the earth's atmosphere, studies to develop ozone-safe compositions for obtaining rigid foam polyurethane used as heat insulation in refrigerating chambers and building constructions were made. The problem of natural and industrial waste water purification was solved by development of a low-waste technology of obtaining a high-molecular-weight flocculant (polyacrylamide) based on acrylonitrile and sulfuric acid. Such one-stage synthesis with no release of side products is caused by the opportunity of simultaneous participation of acrylonitrile in the hydrolysis and polymerization processes. A study of the influence of the nature and concentration of initiators, temperature, and duration of the reactions on the amount and molecular weight of the polymer has allowed optimum technological regimes of effective flocculant synthesis to be found.

The creative life of Professor M. Goldfein is various and many-sided. During several decades he has been successfully engaged in lecturing students of various specialities. He has developed and read lecture courses on the following disciplines: "Chain Reaction Theory", "Kinetics and mechanism of radical polymerization", "Research methods for polymers", "Basics of the physics of synthetic and natural macromolecules", "Scientific basics of environment protection", "Theoretical and applied ecology", "Life safety", and "Concepts of modern natural sciences".

Having music education, he is a keen piano player, frequently attends classical and jazz music concerts. He takes great interest in sport competitions and, whenever possible, takes active part in them (sport games, skating, and skiing). At the same time, my numerous meetings with this person convince me that Professor M. Goldfein considers the creation of his family as the most important achievement of his life and the driving force of his creative activity.

On the threshold of his anniversary the world's scientific community wishes Professor M. Goldfein strong health and good luck!

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