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The Second All-Union Conference on the Problems of Physics of Strength and Plasticity of Polymers

G. E. ZAIKOV and D. S. SAIDOV

The Second All-Union Conference of the Problems of Physics of Strength and Plasticity of Polymers was held in Dushanbe from 10 to 12 October 1990. It was sponsored by the Ministry of Education of the Tadzhik Republic, Tadzhik State University and the Tadzhik Republican Board of the USSR Union of the Scientific Society of Engineers.

The Conference was attended by 120 scientists from 20 towns and cities of the Soviet Union. They represented 35 universities and research institutes of the USSR Academy of Sciences, Republican Academies of Sciences, the State Committee and Ministries of Higher Education, various ministries and departments.

As a whole, 4 plenary reports and 45 plenary and sectional papers were read at the Conference, 80 poster reports were discussed.

The conference was open by the rector of the Tadzhik State University (TSU), F. T. Takhirov and the co-chairmen of the organizing committee M. K. Kurbanaliev (TSU) and A. I. Slutsker from the Physico-Technical Institute (PTI), Leningrad.

In his plenary report M. K. Kurbanaliev presented a review of the research and investigations in the field of the physics and chemistry of polymers in the TSU over the last five years.

The problems of the polymers degradation kinetics were discussed in the plenary report made by A. I. Slutsker. The results of the investigations and studies on the kinetics of polymers degradation of low temperatures raised the problems of involvement of tunnel effects in the breakage of stressed macromolecules. The investigations of free-radical reactions, local heatings and segmental dynamics under stress entailed some problems concerning the chain processes of polymers degradation proceeding along various channels and resulting in accelerated successive breakage of stressed macromolecules. The studies on the electron and electromagnetic phenomena, for example, emission and luminescence occurring upon loading the polymers, the effect of the electric field on the strength of polymers, put forward a task of identifying the specific role of the electron subsystem excitation in mechanical degradation of polymers. A review of the above and some other problems, such as, peculiarities the kinetics of crack propagation in polymers, the effect of intermolecular degradation, etc., present the subject-matter of the report made by A. I. Slutsker.

The latest achievements in the physics of polymers strength over the past five years were discussed in the plenary report made by V. R. Regel (the Institute of Crystallography (IC), Moscow). He reviewed the communications published over the period of 1986–1990 and dedicated to the research in the field of the physics of strength and plasticity of polymers with a view to trace the development of new ideas aimed at further progress of kinetic understanding of the polymer degradation processes. The report was a follow-up of the previous reviewing report made by V. G. Regel at the similar 1st Conference held in Dushanbe in 1986.

Further the work of the Conference proceeded in three sections. The first section dealt with the problem of the polymers degradation physics. Fifteen plenary-sectional reports were made there. Of particular interest were the presentations made by S. V. Bronnikov, I. I. Ibraghimov, V. I. Vettegren, L. N. Korzhavin and S. Ya. Frenkel (the Institute of High-Molecular Compounds (IHMC), Leningrad) dedicated to the description of the polymer degradation process in the (high) viscoelastic state as well as the reports made by V. I. Vettegren, V. G. Leushev and V. N. Meleshko (PTI) on the problems of predicting the time prior to the degradation of adhesive compounds in a wide temperature range.

The report presented by A. I. Slutsker, Kh. Aidarov, T. M. Valiev, I. K. Alieva, V. A. Alexandrov and S. A. Abasov (PTI) concerned the problems of the polymers degradation kinetics in a wide temperature range, the presentations made by O. F. Pozdnyakov and B. P. Redkov (PTI) dealt with the molecular degradation of polyacrylonitrile-based carbon fibers upon loading. Macrostructural heterogeneity and strength of rubbers were discussed in the presentation made by G. A. Patrikeev, Fam Ngok Kanh, A. P. Kondratov, D. E. Shaghin and Bui Chiong (Academy of Chemical Protection (ACP), Moscow); D. Rashidov, S. Misrov, Sh. Tychiev, A. I. Bogdanov and K. Dzhanolilov (Polytechnical Institute (PI), Dushanbe) reported on the investigations of climate- and radiation-aged polymers.

The presentation made by D. S. Saidov (with A. Khasanov, I. Makhmadaliev and Kh. Khabibulloev (TSU) as co-authors) was dedicated to oxidation destruction of elastoplastics in the medium of organic solvents. V. A. Optov (Institute of Chemical Physics (ICP), Moscow) considered some problems of deformation and degradation of polymer-based suspensions. The report made by M. A. Askarov, S. Masharinov and G. I. Uzakov (Institute of Chemistry and Physics of Polymers (TCPP), Tashkent) concerned the problems of polyvinylchloride (PVC) stabilization, for example, the investigation of stabilizers based on N-phenylacryloyl-2-mercaptobenzoxazol. S. Masharinov, Kh. Kamalov and M. A. Askarov (ICPP, Tashkent State University) reported on the development of a new thermostable PVC-based composition. The interaction between the supermolecular structural changes and the chain degradation (destruction) in the SKI-2 vulcanizers was presented by Kh. Khabibulloev, M. Kh. Egamov and M. K. Kurbanaliev (TSU). The report made by M. L. Kerber, A. L. Panin and V. V. Konovalov (Moscow Institute of Chemical Technology (MICT)) was dedicated to the dependence of the long-term service life on the results of short-term mechanical tests of glass-reinforced plastics under bending.

Thirty poster reports were discussed in the 1st section of the Conference.

The second section was devoted to the effect of the external factors on the

structure and properties of polymers. Thirteen plenary-sectional reports were presented. Of particular interest was the presentation made by S. I. Belousov and Yu. K. Godovskii (L. Ya. Karpov Scientific-Research Physico-chemical Institute (SRPI), Moscow) which concerned the study of the effect of phase morphology of the high density polyethylene- and polyester(polyethyleneterephthalate and polybutyleneterephthalate)-based composition upon its behaviour upon thermooriented strengthening. Prediction of properties of some incompatible polymers was presented by E. K. Borisenkova (Institute of Petrochemical Synthesis, (IPS), Moscow). V. A. Filippov and V. A. Mal'chevskii (Institute of Physical Chemistry, (IPC), Moscow) dwelled upon the problems of microdefects and specific features of their development upon degradation of heterogeneous media containing the components of highly distinct heterogeneity.

The report made by A. Karimov, S. Kilicheva, Kh. R. Dzhililov and U. N. Musaev (TSU) was devoted to the effect of γ -radiation on the physico-chemical properties and supermolecular structure of acryl plastics. Wide discussion followed the report made by V. V. Metlov and R. A. Turusov (ICP). It concerned the singular solutions in the mechanics of front solidification and their relationship with inelastic and fragile behaviour of materials. A. A. Turetskii, S. N. Chvalun, V. S. Tikhomirov and Yu. A. Zubov (SRPI) reported about the changes in the structure and physico-mechanical properties of highly-oriented polyethylene due to the action of high dosage of ionizing radiation. Thermooxidizing degradation of copolymers of methylmethacrylate with nitrogen- and sulfur-containing monomers was discussed in the report made by B. A. Mavlyanov, M. R. Amonov, and B. M. Beshilov (Technological Institute of Food and Light Industry, (TIFLI), Bukhara).

The problems concerning the polymer degradation in their fragile and quasifragile state were discussed in the communication presented by S. Sitamov, I. I. Fotiev, A. I. Khukmatov, D. A. Nazarov, and E. M. Kartashev (Moscow Institute of Fine Chemical Technology (MIFCT), Moscow). The report of T. B. Boboev with co-workers (E. M. Dzhonov, Kh. Dadomatov (TSU)) dealt with the effect of the sample thickness on the polyethyleneterephthalate sensitivity to light. The issues concerning the relaxation of stress and creep of polypropylene and polyethylene compositions were considered by A. A. Popov (in collaboration with M. A. Zhurov, O. A. Lednev, G. A. Zaikov, ICP).

A discussion of 25 poster reports was held in the second section.

The third section was devoted to the structure and properties of biopolymers. Much attention was given to the report presented by I. Ya. Kalontarov with co-workers (F. F. Niyazi, Yu. V. Chaiko, N. P. Sotnikova, Institute of Chemistry (IC), Dushanbe). The report contained the data on the application of thermoanalysis methods for determination of the stability of paper containing polymeric additives. The presence of microdefects and its importance for developing the deformation-stability characteristics of plastic compositions based on nitrocellulose and active plasticizers were presented in the report made by V. A. Filippov, V. A. Mal'chevskii and A. V. Klykov (IPC), and V. A. Mal'chevskii and N. V. Cherkashin (IPC) also considered the peculiar changes in molecular-mass param-

eters of colloxylyene in the process of mechanical degradation of colloxylyene-based plastic compositions.

A team of scientists representing the State University and the Institute of Construction Engineers in Nizhnii Novgorod and the Scientific-Production Venture "Polymersintez" in the city of Vladimir presented a teamwork report on strengthening the filled composition by cellulose ethers (L. P. Myasnikova, N. V. Volkova, I. V. Katalevskaya, V. V. Suvorova, V. A. Voitovich, A. A. Nikulina, D. M. Emelyanov). The report made by U. Bolibekov, I. Kh. Yusupov and R. Marupov (Physico-Technical Institute, Dushanbe) concerned the investigation of biopolymers degradation processes by the ESR method; the study of the IR-spectra of cotton fibers dyed by mineral pigments was presented in the report made by G. D. Korodenko, A. V. Zakharchuk, G. T. Khachturova, V. E. Sytsko, E. G. Korodenko, G. F. Pugachevskii (Textile Industry Institute, Moscow).

Numerous reports in this section were presented by the scientists from Tadzhikistan: F. Kh. Sharipov and F. T. Turaev, Tadzhik State Medical Institute (TSMI) ("The Effect of the Cotton Dust on the Morphology of Mucous Membrane of the Front Part of the Respiratory System"), Kh. N. Davronov, R. Sh. Ibragimov (TSMI) ("Possible Ways of Identification of Structural Changes in Biopolymers by Changes in Electroconductivity"), I. Ya. Kalontarov, V. S. Eliseev, Yu. V. Chaiko and F. F. Niyazi, (IC) ("Ozonation of Cellulose Diacetate in Solution"), M. S. Umarov, A. V. Zakharchuk and Z. K. Abdulaeva (TSU) ("The Effect of Radiation on the Stability of the Modified Natural Silk Properties"), I. Ya. Kalontarov, B. D. Kalontarov, (IC) ("Imparting the Biostability to Textile Materials"), etc.

A total of 17 plenary-sectional presentations were made in three sections and 25 poster reports were discussed.

The Conference demonstrated a growing level of investigations in the field of physics and chemistry of polymers strength and plasticity.

In accordance with the decision adopted by the Conference the next Third All-Union Conference on this problem is due to be held in 1995. The materials of the last Conference are available in the libraries of the Tadzhik State University (Dushanbe) and the Institute of Chemical Physics of the USSR Academy of Sciences, Moscow.