

CHRONICLES

FOURTH ALL-UNION CONFERENCE ON HEAT AND MASS TRANSFER (MINSK, MAY 15-19, 1972)

The conference was organized by the State Committee on Science and Technology at the USSR Council of Ministers (the Science Council on the Problem of Mass and Heat Transfer in Technological Processes), the Academy of Sciences of the USSR (Section for Physics Engineering Problems in Power), the National Committee on Heat and Mass Transfer, the Science Council on High-Temperature Thermophysics, the Science Council on Theoretical Principles of Chemical Technology, the Academies of Sciences of the BSSR, the UkrSSR, the LatSSR, and the LitSSR, the Ministerium of Higher and Secondary Specialized Education of the USSR, and the All-Union Council of Scientific-Technical Societies Committee on Desiccation.

The main purpose of this conference was to discuss the huge amount of theoretical and experimental material on various aspects of heat and mass transfer, which had been accumulated since the previous Third All-Union Conference (May, 1968), and also to determine the goals of further research.

All conference material (abstracts, papers, and communications) had been preprinted and distributed among the participants so that they should become familiar with its contents.

Thematic and thematic-survey papers were delivered at section meetings by leading experts on the most urgent problems in heat and mass transfer, followed by a broad discussion on the respective subjects.

Such an organization of the sessions made it possible to devote attention to the most urgent problems without encumbering their general aspects with too much detail.

This conduct of the conference was fully justified by the successful experience in previous conferences.

The program of this conference provided for the presentation of 883 papers and communications, including 77 papers by foreign scientists:

Section 1: "Convective heat and mass transfer," 190 papers and communications (19 papers by foreign scientists);

Section 2: "Heat and mass transfer during physicochemical transformations," 155 papers and communications (17 papers by foreign scientists);

Section 3: "Heat and mass transfer in rheological systems," 74 papers and communications (4 papers by foreign scientists);

Section 4: "Heat and mass transfer in technological processes and apparatus of the chemical industry," 85 papers and communications (6 papers by foreign scientists);

Section 5: "Heat and mass transfer in disperse systems," 77 papers and communications (3 papers by foreign scientists);

Section 6: "Heat and mass transfer in capillary-porous bodies during desiccation," 98 papers and communications (15 papers by foreign scientists);

Section 7: "Transfer properties of substances," 109 papers and communications (5 papers by foreign scientists);

Section 8: "General problems in the theory of heat and mass transfer," 95 papers and communications (8 papers by foreign scientists).

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The conference material was published in 409 folios:

1. "Abstracts of papers and communications of the Fourth All-Union Conference on Heat and Mass Transfer," 22.25 printed folios (typographical) in 1500 copies (in Russian), 18 printed folios (rotaprint) in 200 copies (in English);
2. "Heat and mass transfer," Vol. 1 in three parts (transactions of Section 1), 75 printed folios (rotaprint) in 600 copies;
3. "Heat and mass transfer," Vol. 2 in two parts (transactions of Section 2), 69 printed folios (rotaprint) in 500 copies;
4. "Heat and mass transfer," Vol. 3 (transactions of Section 3), 27.6 printed folios (rotaprint) in 500 copies;
5. "Heat and mass transfer," Vol. 4 (transactions of Section 4), 36.8 printed folios (rotaprint) in 600 copies;
6. "Heat and mass transfer," Vol. 5 (transactions of Section 5), 33 printed folios (rotaprint) in 600 copies;
7. "Heat and mass transfer," Vol. 6 (transactions of Section 6), 38 printed folios (rotaprint) in 600 copies;
8. "Heat and mass transfer," Vol. 7 (transactions of Section 7), 37.5 printed folios (rotaprint) in 600 copies;
9. "Heat and mass transfer," Vol. 8 (transactions of Section 8), 37.2 printed folios (rotaprint) in 600 copies;
10. "Heat and mass transfer," Vol. 9 in two parts (papers by foreign authors not included in the main volumes), 56 printed folios (rotaprint) in 300 copies.

In addition, the conference program issued in typographed copies and its English translation in rotaprint copies.

The Conference was opened by the Vice-President of the USSR Academy of Sciences, Academician M. D. Millionshchikov, who in the name of the USSR Academy of Sciences and the Organization Committee addressed the participants:

"The science of heat and mass transfer comprises a complex body of knowledge from various classical disciplines: hydroaerodynamics, thermonamics of reversible and of irreversible processes, molecular physics, physical kinetics, and physical chemistry of transfer processes. Having combined certain areas of these disciplines into a unified theory of inseparably coupled energy (heat) and mass transfer, the science of heat and mass transfer is now one of the theoretical foundations on which modern engineering and chemical technology rest.

This conference is the fourth one and, like the previous conferences, is held in Minsk not by accident. We owe it to the Institute of Heat and Mass Transfer at the ByelSSR Academy of Sciences, whose work has earned it a well-deserved prestige not only here in the Soviet Union but also abroad.

The director of the Institute is also a delegate to the Science Council at the State Committee on Science and Technology at the Ministerium of Higher and Secondary Education of the USSR, concerned with problems of "Heat and mass transfer in technological processes," he is also the USSR editor of the International Journal of Heat and Mass Transfer.

Quite successfully, the Organization Committee of the Conference has managed to preprint all 860 submitted papers in 12 volumes, has presented both thematical and survey papers so as to set up a favorable background for discussion and thorough evaluation.

These features have made the Minsk conferences an attraction and a tradition widely recognized in this country and abroad.

We are happy to welcome the leading scientists from foreign lands, whose participation in this conference will aid us not only in defining the most important trends in the science of heat and mass transfer but also in developing a mutual understanding and in strengthening the friendly relations between our countries."

In conclusion, Academician M. D. Millionshchikov wished the participants of the conference many successes and achievements in their work.

Professor J. P. Hartnett (USA) addressed the participants of the conference in the name of all foreign scientists.

At the plenary session were heard presentations by Academician A. V. Lykov, member of the ByelSSR Academy of Sciences and representing the Conference Organization Committee, on "Some results and probable trends in the development of the science of heat and mass transfer," then by Academician M. D. Millionshchikov on "Turbulent transfer," and by the corresponding member of the USSR Academy of Sciences, A. A. Samarskii on "Numerical methods of solving nonlinear problems in the mechanics of continuous media."

Since the Third All-Union Conference took place, much valuable scientific-research and experimental-industrial work has been done in the area of heat and mass transfer. These studies were the topic of lively discussions and criticism at the section meetings. Discussed were individual specific problems as well as the most general aspects.

Thus, Section 1 and Section 8 both dealt with problems concerning the numerical methods of solving the equations of hydrodynamics, of heat and mass transfer; they also dealt with the formulation and solution of heat exchanger problems.

As had been done in previous conferences, problems of turbulence were also broadly discussed here (paper by M. D. Millionshchikov presented at the plenary session, papers and discussions in Sections 1 and 4, specifically the paper by D. B. Spalding).

Pointed and interesting was the discussion in Section 3, on the rather new and stormily developing in this country subject of "Heat and mass transfer in rheological systems," on problems in the mechanics of asymmetrical media, on the electrorheological effect, etc.

Problems of sublimation and desublimation were discussed at a point session of Sections 2 and 6.

Much interest and a lively discussion generated the paper by Yu. A. Buevich on "Internal hydrodynamics of fluidized particles" (Section 5), in which the author developed mathematical models of a fluidization bed widely used nowadays in practical applications of technological and chemicotechnological processes. Participants in the discussion emphasized the need for closer collaboration between experimenters and theoreticians.

A broad discussion developed also after the presentation by L. P. Filippov on "Status of research on thermophysical properties and outlook on the thermophysical experiment" (Section 7).

All in all 286 persons participated in discussions at the section meetings.

The Fourth All-Union Conference had aroused great interest. Noteworthy was the high scientific competence level of the participants. They included 9 academicians, 10 corresponding members, 154 doctors of science, and 449 candidates of science. The institutions of higher education were represented by 478 delegates, the scientific-research enterprises were represented by 734 delegates, and industrial plants by 40 delegates.

Of all the four conferences so far, the last one was most representative in terms of both the number of participants and the number of papers and communications. While 740 persons attended the First Conference in 1961 with 290 papers and communications, 438 persons attended the Second Conference in 1964 with 338 papers, and 1217 persons attended the Third Conference in 1968 with 505 papers, the last conference was attended by 1354 persons with 883 papers and communications (over 1500 were submitted).

Interest in the Conference has also developed among foreign scientists. While only 15 foreign scientists from 8 countries attended the First Conference, 36 foreign scientists from 15 countries attended the Second Conference, and 83 foreign scientists from 15 countries attended the Third Conference, the last conference was attended by 103 foreign scientists: 10 representing Bulgaria, 4 representing Poland, 13 representing East Germany, 1 representing Romania, 6 representing Hungary, 1 representing Vietnam, 12 representing Yugoslavia, 20 representing Czechoslovakia, 4 representing Great Britain, 1 representing the Netherlands, 4 representing West Germany, 4 representing Japan, 8 representing France, 2 representing Canada, and 13 representing the United States.

During the working sessions several meetings were arranged between Soviet and foreign scientists. Thus, two sessions were held in assembly on concerning the organization of international conferences on heat and mass transfer, the editorial board of the International Journal on Heat and Mass Transfer met, the editorial board and staff of the All-Union Journal of Engineering Physics met, also Academician M. D. Millionshchikov, the Vice-President of the USSR Academy of Sciences, met and talked with the American scientists J. P. Hartnett and U. Ervin.

The Conference received high praises from its participants. Thus, at the concluding plenary session Professor U. Griegul of the Technical University in Munich (West Germany), President of the International Conference Assembly on Heat Transfer, said:

" . . . Four days of hard work have passed since the opening of the Conference. In my opinion and in the opinion of my colleagues who came here with me, these days have been extremely fruitful. We had the opportunity to exchange views and to talk about problems of interest to us. I was again convinced and reassured that Soviet science is very highly developed . . . , we have now the opportunity to ascertain that the problem of heat and mass transfer serves two functions. On the one hand, it is a basic science of great significance when applied to practical problems. On the other hand, it provides a very unique medium for strengthening international scientific bonds. I would like to emphasize that both the Soviet Union and the Institute of Heat and Mass Transfer in Minsk are powerful organizations, the latter making a great contribution to the internationalization of this science. I believe our visit here and our participation in your Conference will help to strengthen the relations between us in the scientific domain and to overcome certain prejudices."

Professor Eed, Acting Dean of the Aston University (Edinburgh, Scotland), said:

" . . . As others have already said before me, we are very much impressed by the high quality of papers presented and discussed at this Conference. Their careful preparation and the contents of the ensuing discussions indicate a great deal . . . Distinguished Academician Lykov, I would like to thank you and the Organizing Committee and to congratulate you on this extremely fruitful conference . . . "

Professor T. Mizushino (Japan) said:

" . . . First of all, I was astonished to see so many participants at this conference, because it indicated the importance and the scope of research in heat and mass transfer in your country. Secondly, I note that the number of participants has increased and this indicates that the problem of heat and mass transfer is becoming of still greater concern in your country . . . I could say that our presence at this conference on heat and mass transfer has turned it into a Conference on Friendship Transfer between various countries. Thus, it would be very desirable if even more participants were to come and meet in Minsk in 1976 . . . "

Professor Mikhailov (Bulgaria) said:

" . . . For us Bulgarian scientists it was a great pleasure to participate in this conference. It is, in a way, difficult to overestimate its significance . . . after the conference we will be fully aware of the new ideas and problems discussed here . . . "

Professor S. Pabis (Poland) said:

" . . . Your Institute has become one of the world's major centers in the science of heat and mass transfer . . . Within a short time, we too have managed in our country to apply scientific principles to the desiccation of agricultural products - I mean modern desiccation techniques based on theoretical and experimental studies made in the Soviet Union and, specifically, at the Institute of Heat and Mass Transfer . . . "

The Conference adopted the following resolution.

The Twenty-Fourth Communist Party Congress has set a still higher goal for the industry, the agriculture, and for construction, in order to raise the prosperity level of the entire Soviet nation. A great role in solving these grandiose tasks play the results of research in heat and mass transfer as well as the new technological processes and apparatus based on these results and developed for the purpose of making new materials, products, foodstuffs, chemicals, etc.

Inasmuch as most technological processes involve the transfer of energy and mass, enormously important become achievements in those branches of science on which the science of heat and mass transfer

is based: thermophysics, hydro- and aerodynamics, thermodynamics, special-purpose mathematics, physical and colloidal chemistry, and also studies concerning the types of moisture bonds with matrix materials.

Developments in the science of heat and mass transfer make it feasible to design highly productive machinery and intensive technological processes.

Recognition must be given to the development work done pertaining to the theory of energy and mass transfer in matter, specifically heat and mass transfer during the flow of liquids and gases at high velocities and high temperatures, under vacuum or under high pressures, in rheological and in disperse systems, in electric and magnetic fields, during phase transformations and during chemical reactions; noteworthy are also the simulation of heat and mass transfer processes and numerical methods of solution. Of special interest is the search for methods of determining the thermophysical, the mass-transfer, the rheological, the electrical, the magnetic, and other properties of materials as well as the design of new instruments for this purpose.

Along with all this, the Conference recognizes also the not yet fully coordinated planning of scientific-research and experimental-industrial activities in the area of heat and mass transfer.

Not all available means have been utilized for the exchange of information and for communicating the results of research.

After a discussion and an exchange of views, the Conference considers it worthwhile to indicate the following basic directions for further scientific research on heat and mass transfer:

1. To continue the development of theoretical and experimental methods of studying heat and mass transfer processes, with special attention to the problem of turbulent flow of liquids, gases, and their mixtures (two-phase and multicomponent systems), making intensive use of modern computer techniques and contactless measurement techniques; also to continue the development and the application of composite automatic systems to test sampling and data processing in the experimental phase of research.

2. To expand the research activity concerning transfer phenomena during the anisothermal flow of heterogeneous media, multicomponent and multiphase mixtures, rheological and disperse systems, under low or high pressures, in electric, magnetic, or other fields. It is worthwhile to expand research on the transfer effects in disperse systems and to tie it in with the problem of producing systems with prescribed and widely-adjustable properties.

3. It is absolutely necessary to continue further theoretical and experimental research on heat and mass transfer processes during phase transformations and chemical reactions (during boiling at a high rate and under heavy heat loads, at high and at cryogenic temperatures, under various hydrodynamic conditions; during evaporation and sublimation under various conditions of melting or freezing; etc.).

4. Concerning the theory and the practice of desiccation, to continue further developments, for the purpose of arriving at highly productive methods and techniques based on achievement in the science of heat and mass transfer.

5. To continue the search for most general, most reliable, and fastest methods of determining the thermophysical, the mass-transfer, the rheological, the electrical, the magnetic, and other properties of matter under various conditions. It is worthwhile to unify these methods and to ensure that the necessary instruments can be manufactured serially.

6. To continue theoretical and experimental research on phenomena occurring in various technological processes and devices. To proceed in every way with the development of new methods of intensifying the heat and mass transfer processes in the chemical industry, and to apply these methods to the construction of apparatus characterized by high efficiency and high power density.

The work of creative study groups in all those areas should be coordinated with the work of science councils on specific problems.

The scientific-technical forecast originally made by the Science Council on "Heat and mass transfer in technological processes" at the State Committee of the USSR Council of Ministers is to be refined and projected through the 1971-1985 period.

The All-Union Conference on Heat and Mass Transfer considers it necessary:

1. To speed up the implementation of scientific results in modern technological processes and apparatus for industry and agriculture.
2. To publish all thematic and thematic-survey papers presented at the Conference as well as the discussion material.
3. To issue, in another edition, certain transactions of the Conference.
4. To begin the publication of a new All-Union Journal "Heat and mass transfer," in view of the large increase of research activity in this field.
5. To convene in 1976 a Congress on Heat and Mass Transfer. To recommend that scientific-research organizations arrange conferences and symposia on the earlier-defined scientific problems in heat and mass transfer.

The Conference recognizes the appropriateness, the high scientific-theoretical level, and the practical aim of the numerous papers presented at the Conference by the Institute of Heat and Mass Transfer at the ByelSSR Academy of Sciences – the headquarters in dealing with the problem of "Heat and mass transfer in technological processes. All those papers had the one subject in common: heat and mass transfer in capillary-porous bodies, disperse systems, and rheological media, i. e., in variable-memory systems.

The participants of the Conference gratefully acknowledge the tremendous effort made by the Organization Committee to ensure successful proceedings.