

## REPORT ON EUROMECH-285

### KINETIC THEORY OF TRANSFER PROCESSES WITH EVAPORATION AND CONDENSATION MINSK, 25-27 SEPTEMBER, 1991, BYELORUSSIA, USSR

The Euromech-285 Colloquium was held at the A.V. Luikov Heat and Mass Transfer Institute of the Academy of Sciences of the Republik of Belarus. It was attended by the scientists from seven countries. Among them, Italy, Japan, Norway, France, Bulgaria and Vietnam were represented by one scientist each, 40 scientists from the USSR were present at the Colloquium. Unfortunately, Muller-Krumbhaar, Lang and Adomeit ( Germany ), Nanbu ( Japan ), Frezzotti ( Italy ) and Widder ( Austria ), Janitsky, Bobylev and Chekmarev ( USSR ) failed to attend.

The Colloquium was held at the writer's house in the suburbs of Minsk. The joint Soviet-American Enterprise "TEMPO" and International Centre on Training Scientist in Heat and Mass Transfer Problem at the Heat and Mass Transfer Institute have rendered essential help in arranging the Colloquium. Note that the above Centre held a school-seminar on the same problem in 23-24 September. Since 25 September, the participants of this school have attended lectures at Euromech - 285.

The Euromech - 285 co-chairmen were Profs. C. Cercignani (Italy, Milan) and O.G. Martynenko, the Director of the Luikov Heat and Mass Transfer Institute.

The main goal of the meeting was to convoke the scientists dealing with kinetics of transfer processes with evaporation and condensation and to discuss the state-of-the-art in this field.

Transfer processes including phase changes as well as those with evaporation and condensation, represent one of the most important fields in the heat and mass transfer theory. When developing new production processes connected with heat and

mass transfer enhancement, kinetic aspects of transfer processes including evaporation and condensation become of importance. During the Colloquium, much time was given to discussion of urgent problems of kinetics of intensive evaporation and condensation, calculation of nonequilibrium mass transfer in porous media with regard to evaporation and condensation, homogeneous nucleation in gases, gas adsorption and desorption, kinetics of phase transitions in metals, as well as of the problems of the Boltzmann equation numerical solution.

At the Colloquium five lectures were delivered ( by C.Cercignani, M.N.Kogan, Y.Sone, A.P.Kryukov and S.I.Anisimov ), and 15 reports were presented at 4 sessions ( see Program ).

The first session was devoted to the problems of intensive evaporation and condensation. Prof. C.Cercignani (Italy) lectured on recent achievements and problems in the kinetic approach to evaporation and condensation. In his lecture, Prof.M.N.Kogan (USSR) dealt with the problems connected with description of intensive processes, in particular of supersonic condensation, while Prof.A.P.Kryukov (USSR) dwelt upon ultimate regimes of intensive surface condensation. Prof.Y.Sone from Japan gave a numerical analysis of flows with evaporation from a cylindrical body surface.

At the second session, in the Prof.S.I.Anisimov's lecture (USSR), based on the analytical and numerical solutions, a qualitative picture of the interaction between laser radiation and metal was presented and kinetics of phase transitions in them was discussed. Consideration was also given to a two-phase Knudsen layer in case of intensive evaporation in the presence of a dust component ( T.Ytrehus,Norway ), flows in the models of cryovacuum devices ( F.G.Tcheremissine,USSR ), evaporation and condensation of diatomic gas between parallel plates (A.Frezzotti,Italy; S.Stefanov,Bulgaria ).

At the third session, the calculation results (including those by Monte - Carlo method) were reported on gas flows in

porous bodies in the presense of phase transitions on pore walls (S. Stefanov, Bulgaria; G. E. Gorelik, USSR); kinetic adsorption and desorption models were considered (V. D. Selesnev, USSR). The studies on monomolecular theory of volume condensation were reviewed (A. L. Itkin, USSR); theory of nonequilibrium Knudsen layer with intensive surface evaporation and condensation was presented (D. A. Shapiro, USSR) and the problems of giving grounds to the method of direct statistical modelling of rarefied gas flows were discussed (M. S. Ivanov, USSR).

At the fourth session, the problems were discussed of applying nonequilibrium thermodynamics methods to describe transfer in rarefied gases (V. I. Poldughin, USSR) and ensemble - averaging method to describe transfer in dense disperse systems at arbitrary Knudsen numbers (A. Yu. Zubarev, USSR). The quantum - kinetic theory of transfer processes in vibrational - nonequilibrium multiatomic gases was reported (V. I. Kruglov, USSR). The methods for calculating high-gradient flows using series expansion of the distribution function not only in terms of Maxwell functions but also in terms of their derivatives (A. Ya. Ender, USSR), as well as discrete models of the Boltzmann equation (N. A. Nurlybaev, USSR) were discussed.

On the last day of the Colloquium, a general round - table discussion was held by Prof. A. P. Kryukov. The following questions were considered:

1. On Intensive Evaporation and Condensation  
(O. G. Friedlender, T. Ytrehus, Y. Sone, D. A. Shapiro)
2. On the Calculation Procedures for Rarefied Gas in Porous Media  
(F. G. Tcheremissine, N. V. Pavlyukevich, A. Ya. Ender)
3. Homogeneous Condensation Problems  
(S. P. Fisenko, A. L. Itkin, T. Ytrehus, M. S. Ivanov)
4. Interaction of Gases and Surfaces  
(V. I. Tokmantsev, V. D. Selesnev, A. P. Kryukov, A. D. Shapiro, F. G. Tcheremissine)
5. Evaporation and Condensation Coefficients

(A. P. Kryukov, V. V. Levdansky)

6. Methods of Mathematical Physics in Kinetic Gas Theory  
(C. Cercignani, A. B. Bartman, S. P. Fisenko, S. Stefanov)

Proceedings of the Colloquium are published. The scientific level of lectures and papers is high.

November 25, 1991



Prof. C. Cercignani (Italy)  
Chairman of the Euromech - 285



Prof. N. V. Pavlyukevich  
(USSR, A. V. Luikov Heat and  
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