

Scientific report of
32nd IUVSTA Workshop on
Gas-Surface Interactions
25 – 29 September 2000

In the frames of Workshop it was first IUVSTA meeting on Gas-Surface Interaction. The workshop was held at Repino, near St. Petersburg, Russia from 25 to 29 September 2000. The topics discussed at the workshop were molecular beam experiments, scattering of molecules of clean surfaces, scattering of molecules of contaminated surfaces, molecular dynamics simulation of energy accommodation, models of gas surface interaction, identifications of energy and momentum accommodation from experiments in transient aerodynamic flows, direct statistical simulation in analysis of flow-surface interaction, influence of surface roughness on accommodation were discussed on the level of the modern state of art. This workshop can be considered successful as it turned out that it has covered the range of problems planned beforehand.

The problems of the surface modification by gas-surface interaction with and without chemical reaction were discussed as well. The problem of elaboration of new sophisticated algorithms for computations of collision of complex objects with application for gas dynamics and surface scattering were considered as possible only with coupling of quantum mechanics, molecular mechanics modeling and molecular beam experiments.

In the result of workshop discussion it became clear that there are possibility to use “traditional” method of CARS diagnostics for determination of accommodation coefficients from a wide range of applications from CVD to hypersonics.

A special characteristic of this workshop was the broad discussion of problems of gas-surface interactions in the aspects of space applications and vacuum technologies applications. This turned to be possible due to invitation of specialists in surface science and space technology.

In the frame of the workshop official round table discussions were performed with evaluation of current state of the gas-surface interaction researches.

This workshop brought together scientists from Russia, Japan, Great Britain, France, USA, Italy, Ukraine, Netherlands. The total number of participants was 37 including 10 invited speakers.

Besides discussions according the schedule of official presentations, the scientific contacts have resulted in the negotiations between different research groups on cooperation. It concerns the possible mutual investigations of theoreticians and experimenters.

The participants have stated the high scientific level of the workshop and its perspective use. Also, the workshop location in a quiet place at a distance of 40 km from St.-Petersburg contributed to the success of the workshop.

A. K. Rebrov,
Professor, Chairman of the 32nd IUVSTA Workshop

List of participants “32nd IUVSTA Workshop”

1.	Dr. J-P. Taran	France
2.	Dr. M. Lefebvre	France
3.	Dr. A. Hodgson	UK
4.	Prof. I. Greber	USA
5.	M. Greber	USA
6.	Prof. A. Kleyn	Netherlands
7.	J. I. VAN Weede	Netherlands
8.	Prof. K. Yamamoto	Japan
9.	Prof. P.A. Gorry	UK
10.	Prof. C. Boragno	Italy
11.	M.G. Fossati	Italy
12.	Dr. J.C. Lengrand	France
13.	I. Ribet	France
14.	Prof. V.P. Bass	Ukraine
15.	Academician A.K. Rebrov	Russia
16.	Academician Yu.A. Ryjov	Russia
17.	Prof. R.G. Barantsev	Russia
18.	Prof. G.A. Lukianov	Russia
19.	Dr. N.G. Gorchakova	Russia
20.	V.V. Krzhizhanovskaya	Russia
21.	Dr. M.Yu. Plotnikov	Russia
22.	T.V. Levchenko	Russia
23.	V.V. Zakharov	Russia
24.	Prof. S.F. Borisov	Russia
25.	Dr. Yu. E. Gorbachev	Russia
26.	Prof. A.V. Bogdanov	Russia
27.	Dr. M. Ponomarjov	Russia
28.	I. Nikitin	Russia
29.	Prof. E. I. Sokolov	Russia
30.	Dr. A.B. Nadiradze	Russia
31.	Prof. I.A. Khalidov	Russia
32.	Dr. O.A. Aksenova	Russia
33.	Prof. H. Metiu	USA
34.	Prof. S. Svirschevski	Russia
35.	Dr. V.V. Berezin	Russia
36.	S.P. Golenski	Russia
37.	Prof. A.A. Pyarnpuu	Russia

Workshop program

**Sunday, September 24, 2000,
18:00**

Social Event

Welcome reception in Cinema Art House "Repino"

**Monday, September 25, 2000
10:00 – 17:15**

Chairman: A. Kleyn

10:00 – 10:20 **Introductory address:** Prof. **A.K. Rebrov**, chairman of the Workshop

10:20 -11:20 **Invited lecture:** *Molecular dynamics study of the accommodation of monatomic molecules on the platinum surface*, **K. Yamamoto**, Okayama University, Japan

11:20 – 11:50 *Simulation of plasma flows interacted with body surfaces and external magnetic fields*,
M.Ponomarjov, State Academy of Aviation Technology, Tutaev, Yaroslavl region, Russia

11:50 – 12:20 *Generalized model of gas particles interaction with a surface*, **A.B.Nadiradze**, Moscow State Aviation Institute, Russia

12:20 – 14:00 Lunch break

Chairman: A. Bogdanov

14:00 – 15:00 **Invited lecture:** *Investigation of supersonic rarefied flow interaction with the surface of space vehicles*, **V. P. Bass**, Rarefied Gas Dynamics, Institute of Technical Mechanics of National Academy of Science and National Space Agency of Ukraine

15:00 – 15:30 **Invited lecture:** *Validation of gas-surface interaction models: feasibility of new experiments*,
J.C. Lengrand, Laboratoire d'Aérodynamique du CNRS, France

15:30 – 16:00 **Invited lecture:** *Study of accommodation: from CVD to hypersonics*, **J. P. Taran**, ONERA, France

16:00 – 16:15 Break

16:15 – 17:15 **Invited lecture:** *Computation of scattering and accommodation using molecular simulation*, **I. Greber**, Department of Mechanical & Aerospace Engineering Case Western Reserve University, USA

**Tuesday, September 26, 2000
9:00 – 16:30**

Chairman: K. Yamamoto

9:00 – 10:00 **Invited lecture:** *Partial passivation of metal surfaces*, **A. Kleyn**, Leiden Institute of Chemistry, Gorlaeus Laboratories, Leiden University, Netherlands

10:00 -10:30 *Product state analysis of surface reactions*, **A. Hodgson**, Surface Science Research Centre, University of Liverpool, UK

10:30 – 10:45 Break

10:45 – 11:45 **Invited lecture:** *Nanoscale modification of metal surfaces by ion sputtering*, **C. Boragno**, Dipartimento di Fisica, Università di Genova, Italy

11:45 – 12:15 *Electrode screening by metal clusters in plasma discharges*, **G.I.**

Zmievskaia*, **T.V. Levchenko****, **T.K. Soboleva*****

*) Keldysh Institute of applied mathematics RAS, Moscow,

**) VNIIGeoSystems, Federal Research Center, Moscow

***) Instituto de Ciencias Nucleares, Uni Nacional Autonoma de Mexico

12:15 – 14:00 Lunch break

Chairman: J.P. Taran

14:00 – 15:00 **Invited lecture:** *Study of energy and momentum accommodation coefficients in gasdynamic experiments*, **S. F. Borisov**, **O. Sazhin**, **P. Polikarpov**, Ural State University, Ekaterinburg, Russia

15:00 – 15:30 *Dissociative adsorption rate constant calculations*, **A.S. Gevorkyan**, **Yu.E. Gorbachev** and **I. Nikitin**, Institute for High Performance Computing and Data Bases, St.Petersburg, Russia

15:30 – 16:00 *Application of time-domain CARS to supersonic flow diagnostics. Investigation of slipping flow conditions*, **I. Ribet**, **M. Lefebvre**, ONERA, France

16:00 – 16:30 *Propagator method for investigation of self-organization phenomena at macromolecule scattering on silicon surface*, **I. Golovnev¹, T. Basova², E. Golovneva¹, I. Igumenov²**,
¹Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
²Institute of Inorganic Chemistry, Novosibirsk, Russia
17:30 – Visit into Theatre

Wednesday, September 27, 2000

9:00 – 13:00

Chairman: A. Hodgson

9:00 – 10:00 **Invited lecture:** *Molecular beam scattering study of inelastic scattering, trapping + desorption and reactive scattering in Br₂ + GaAs(100)*, **P.A. Gorry**, Department of Chemistry University of Manchester, UK
10:00 – 10:30 Influence of surface roughness on rarefied gas flow in a channel, **O. A. Aksenova, I. A. Khalidov, V. P. Memnonov**, St.-Petersburg State University, St.-Petersburg, Russia
10:30 – 11:00 *Fractal modeling of surface roughness in the problem of rarefied gas flow in a channel*, **O.A. Aksenova**, St.-Petersburg State University, St.-Petersburg, Russia
11:00 – 11:30
11:00 – 11:15 Break

Chairman: S.F. Borisov

11:15 – 13:00 Round table discussion
13:00 – 14:00 Lunch break
14:30 Visit to St-Petersburg by interest of participants.

Thursday, September 28, 2000

9:00 – 15:00

Chairman: Y. Ryjov

9:00 – 10:00 **Invited lecture:** *The algorithms for computations of collision of complex objects with application for gas-surface scattering*, **A.V. Bogdanov**, Institute for High Performance Computing and Data Bases, St.-Petersburg, Russia
10:00 -10:30 *Superthermal H₂ molecules from interstellar grains*, **A.A. Pyarnpuu¹, V.V. Cheredov¹, V.I. Shematovich²**
¹ Moscow State Aviation Institute, Moscow, Russia
² Institute of Astronomy of the RAS, Moscow, Russia
10:30 – 10:45 Break
11:45 – 12:15 *Using of stochastic analog method for simulation of fluctuation stage of blistering*. **A.L. Bondareva and G. I. Zmievskaia**, Keldysh Institute of Applied Mathematics Russian Academy of Sciences, Russia
12:15 – 14:00 Lunch break
14:00 Closing discussion
19:00 – Banquet

Friday, September 29, 2000

9:00 - Excursions in Petergoff and St-Petersburg.

Companion program.

Monday, Tuesday, Thursday

Day Time :

Visits Museum and exhibitions of St-Petersburg.