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Editorial

Stereodynamics of Chemical Reactions

The Stereodynamics of Chemical Reactions is a flourishing field which has emerged from what was at one time referred to as the "lunatic fringe of chemistry" [D.R. Herschbach, Faraday Discussion of the Chemical Society No. 55. The Chemical Society, London 1973, page 250]. Novel contributions in the field are presented at a biannual conference started in Jerusalem in 1987. The spirit and goal of these symposia are "to bring together physicists and chemists working with beams, photons and Hamiltonians, to get in touch with the vectorial nature of bond making and breaking in molecules, clusters and at surfaces". Following the tradition, this topical issue collects the best part of the original work presented at Stereodynamics 2004 held in Osaka.

The Editors of the present volume observe with pleasure how new tools, both theoretical and experimental, have been developed to find the "vectors" featuring the stereodynamics of elementary events in gas-phase, clusters and gas-surface reactive and non-reactive processes.

Following the special invited paper of our Laureate D.R. Herschbach, the contents of this volume has been organised into various categories: the first deals with the dynamics and stereodynamics of (gas-phase) bimolecular collisions. Thus, steric effects of the electron attachment, high resolution imaging technique under crossed-beam conditions, reagent state dependence on both neutral or Penning ionisation, and angular correlations in complex-forming reactions are, amongst others, good examples of the scientific level and technical achievement in this research area.

A significant number of contributions concern gas-surface interaction, the second category selected from the contributed papers and one of the areas of major development in our field in recent years. Several contributions on the molecular orientation or alignment dependence of gas-surface collisions, or reagent state dependence of catalysis are good examples of the present status of stereodynamics at the gas-surface interface.

While the previous subject categories could be classified as full collision studies, the half collision approach including, for example, (photo) dissociation studies comprises the third class of contributions included in this issue. Here the velocity ion imaging technique or the study of dissociation mechanisms by charge inversion mass spectrometry provide unprecedented resolution of the molecular process under study.

A section on isolated molecules and clusters follows in which powerful ab initio theories and DFT treatments reveal todays capability to calculate the steric properties and structural nature of large molecules or clusters.

Several contributions on molecule field interactions form the next section of our volume. The interaction of atoms and molecules with magnetic or electrical fields has played a central role in our understanding of the structure of matter. In our field of stereodynamics, this interaction is crucial for reagent state preparation or product state analysis. A step forward here has been the use of external field interaction to control the stereodynamical behaviour of the system, for example: (i) the photon-molecule interaction operating in a strong magnetic field (ii) the beam orientation by the combined action of static and non-resonant electric fields or (iii) the manipulation of the trajectory of a polar molecule by resonant RF field. Finally in the spirit of the Osaka meeting some papers report new experimental developments on mass spectrometry.

We thank all authors for their cooperation in preparing their contributions and especially to the Osaka meeting organising committee. Our special gratitude goes to the Editors-in-Chief of the European Physical Journal D who kindly accepted the production of this special issue, which also had the invaluable technical assistance of the Editorial Office Secretary.

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