

# OKAZAKI IMS CONFERENCE

## Okazaki IMS Conference 2003

**International Symposium on Functional Clusters and Cluster-Based Nano-Materials**  
December 15–18, Main Conference Room of Okazaki Conference Center

Clusters with several to several hundred atoms or nano-particles with several thousand atoms exhibit various properties dependent on their size and has lately attracted considerable attention as functional materials in the next generation. With the 20 invited speakers from abroad, we discussed the following 6 subjects from the points of future development of this field.

1) thermodynamic properties of gas phase clusters, 2) geometrical and electronic structures of gas phase clusters, 3) reactivity of clusters, 4) structure and reaction dynamics of molecular clusters, 5) supported clusters, 6) magnetic properties of clusters and single domain magnets, nano-particles, and nano-clusters.

Following to the welcome address by the director general, Prof. Koji Kaya, Prof. A. W. Castleman presented a plenary lecture titled "Cluster reactions and properties: Laying the foundation for cluster assembled materials." He introduced the ways of making metal alloys with carbon. Dr. B. Simard introduced the methods of dispersing iron oxide nanoparticles in a polymer film and gold-silver alloy formation in the liquid phase. Prof. H. Haberland reported the size effect of sodium clusters on the thermodynamic properties. They found that the some specific clusters show negative heat capacities. Prof. M.F. Jarrold presented the experiments and theoretical analyses on the structure and the binding energies of  $\text{Na}^+(\text{NaCl})_n$  ( $n = 20\text{--}40$ ) clusters. Prof. Kaya introduced the research of his group in Keio University. Prof. K. Bowen reported the size dependence on the ionization potentials and magnetic dipole moments of nickel and aluminum clusters. A very interesting report on gold clusters was presented by Prof. L. -S. Wang who found aromatic properties in the gold clusters with planer wheel-type structures. Prof. R. Whetten from Georgia Institute of Technology reported electrode formation with  $\text{C}_{76}$  and capacitance properties of silver clusters with super-shell structures. Prof. Landman from the same university introduced the consideration on electric properties of several metallic and semiconductor clusters from the points of free energy and entropy. In addition to the 20 invited talks, 9 Japanese speakers also presented original works and young people displayed 52 poster presentations.

Many exciting reports presented in this conference made us confirm that the development of cluster science and technology will give us more opportunities of finding more interesting properties of new cluster systems and nano-particles of new composite atoms and molecules. On the last day we had fruitful discussion time in Gamagoori Prince Hotel and enjoyed the garden

and the beach area. This meeting will be taken over in the two symposia of PacificChem 2005, "Frontiers in Structural and Functional Studies of Atomic and Molecular Clusters, and Nano-particles," and "Advances in Cluster Sciences and Nanoparticles Technologies."

### PROGRAM

#### *December 15 (Monday)*

- 8:50– 9:00 **K. Kaya** (Director General, IMS)  
Opening Address
- 9:00– 9:50 **A. W. Castleman** (Pennsylvania State University)  
Cluster reactions and properties: Laying the foundation for cluster assembled materials
- 9:50–10:35 **B. Simard** (National Research Council of Canada)  
Transition metal clusters in the gas phase and in solutions—Towards the fabrication of functional materials
- 10:50–11:35 **H. Haberland** (University of Freiburg)  
Experimental thermodynamics of small systems: Melting and boiling of clusters
- 11:35–12:20 **M. F. Jarrold** (Indiana University)  
Melting of clusters and nanocrystals
- 13:40–14:25 **K. Kaya** (IMS)  
Cluster science in Keio: Creation and development of cluster chemistry
- 14:25–15:10 **M. Kappes** (Universitat Karlsruhe)  
Physical and chemical properties of coinage metal clusters
- 15:10–15:55 **J. H. Parks** (Rowland Institute at Harvard)  
Electron diffraction of trapped metal clusters
- 16:15–17:00 **K. H. Bowen** (Johns Hopkins University)  
Photoelectron spectroscopy of cluster anions
- 17:00–17:45 **L. -S. Wang** (Washington State University)  
Planar clusters: from aromaticity to molecular wheels
- 17:45–18:05 **A. Nakajima** (Keio University)  
Photoelectron spectroscopy of binary cluster anions
- 18:05–18:25 **A. Terasaki** (Toyota Institute of Technology)  
Laser spectroscopy of free, trapped, and deposited cluster ions

**December 16 (Tuesday)**

- 9:00–9:45 **T. Kondow** (Toyota Institute of Technology)  
Size-dependent physical and chemical properties of metal clusters
- 9:45–10:30 **P. Armentrout** (University of Utah)  
Bond energies of molecular fragments to transition metal clusters
- 10:50–11:35 **R. L. Whetten** (Georgia Institute of Technology)  
Selected gold and metal-oxide clusters as model low-temperature oxidation catalysts
- 11:35–12:20 **A. Rosen** (Göteborg University)  
Molecular dynamics study of catalysed carbon nanotube growth within the vapor-liquid-solid model
- 13:30–14:15 **J. M. Farra** (University of Rochester)  
Size-dependent electron density redistribution in polar solvent-alkaline earth cluster ions
- 14:15–14:35 **F. Misaizu** (Tohoku University)  
Excited state charge-transfer process and dissociation dynamics of Mg<sup>+</sup>-methyl halide complexes
- 14:35–14:55 **K. Fuke** (Kobe University)  
Electronic properties of hypervalent clusters
- 15:15–16:00 **S. K. Kim** (Seoul National University)  
Conformation dependent structure and dynamics of amino acid and its clusters
- 16:00–16:20 **M. Fujii** (Tokyo Institute of Technology)  
Picosecond time-resolved IR spectroscopy on 7-azaindole dimer—Bridge from cluster to solution
- 16:20–16:40 **H. Sekiya** (Kyushu University)  
Excited-state double proton transfer dynamics in deuterated 7-azaindole dimers studied by hole-burning spectroscopy
- 16:40–17:00 **A. Fujii** (Tohoku University)  
Infrared spectroscopy of large sized water containing cluster cations: Development of the three-dimensional hydrogen bond network with the cluster size
- 17:00–19:00 **Poster Session**
- 11:10–11:55 **M. Broyer** (CNRS and Universite Lyon)  
Clusters on surfaces and embedded in matrix: organization, optical properties and dynamics
- 13:10–13:55 **M. B. Knickelbein** (Argonne National Laboratory)  
Toward molecular magnetic materials: Molecular beam characterization of magnetic clusters and complexes
- 13:55–14:15 **N. Nishi** (IMS)  
Air-stable Fe nanoparticles and nanorods with graphitic carbon-skins
- 14:15–14:35 **T. Yamase** (Tokyo Institute of Technology)  
Quantum tunneling of magnetization of VO<sup>2+</sup>-triangle-containing polyoxotungstates and self-assembly of polyoxomolybdates and -tungstates to nano-ring superclusters
- 14:35–14:55 **K. Sumiyama** (Nagoya Institute of Technology)  
Composite state control of two different clusters *via* gas phase
- 15:15–16:00 **D. J. Schiffrin** (University of Liverpool)  
Functionalised nanoparticles and molecular linkers: optical and electrical properties
- 16:00–16:45 **J. Cheon** (Yonsei University)  
Novel anisotropic inorganic nanocrystals: diamonds, wires and stars
- 16:45–17:05 **T. Teranishi** (Advanced Institute of Science and Technology)  
Planar patterning of gold nanoparticles for nanoelectronic devices
- 17:05–17:25 **T. Tsukuda** (IMS)  
Photochemical and photophysical properties of subnanometer-sized gold clusters
- 17:25–17:35 **N. Nishi**  
Closing Address

**December 17 (Wednesday)**

- 9:00–9:45 **U. Landman** (Georgia Institute of Technology)  
Small is different: self-selection, assembly, and non-scalable evolution of nanoclusters
- 9:45–10:05 **J. Murakami** (National Institute of Advanced Industrial Science)  
Low-temperature activation and direct oxidation of dinitrogen on supported tungsten nanoclusters
- 10:25–11:10 **C. Brechignac** (CNRS)  
Nanosystems from cluster deposition: formation, stability and organization