Final report

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International Symposium on Clusters and Nanostructures

(Energy, Environment, and Health)

November 7-10, 2011

Richmond, Virginia Commonwealth University

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Summary

The international Symposium on Clusters and Nanostructures was held in Richmond, Virginia during November 7-10, 2011. The symposium focused on the roles clusters and nanostructures play in solving outstanding problems in clean and sustainable energy, environment, and health; three of the most important issues facing science and society. Many of the materials issues in renewable energies, environmental impacts of energy technologies as well as beneficial and toxicity issues of nanoparticles in health are intertwined. Realizing that both fundamental and applied materials issues require a multidisciplinary approach the symposium provided a forum by bringing researchers from physics, chemistry, materials science, and engineering fields to share their ideas and results, identify outstanding problems, and develop new collaborations.

Clean and sustainable energy sessions addressed challenges in production, storage, conversion, and efficiency of renewable energies such as solar, wind, bio, thermo-electric, and hydrogen. Environmental issues dealt with air- and water-pollution and conservation, environmental remediation and hydrocarbon processing. Topics in health included therapeutic and diagnostic methods as well as health hazards attributed to nanoparticles. Cross-cutting topics such as reactions, catalysis, electronic, optical, and magnetic properties were also covered.

The symposium attracted 155 participants from 26 countries in the world. It featured 39 invited speakers in 14 plenary sessions and one key-note session. Eighty-five contributed papers were presented in two poster sessions and 14 papers from this list were selected to be presented orally at the end of each session to highlight hot topics. Papers presented at the symposium were reviewed and published in the Journal of Nanoparticle Research so that these can reach a wide audience. The symposium was highly interactive with ample time allotted for discussions and making new collaborations. The participants' response was that this was a high quality conference and covered topics at the cutting edge of science and technology.

The symposium was endorsed by the American Physical Society, The Materials Research Society, SPIE, The Metallurgical Society, and the American Vacuum Society.

The symposium was supported by external grants from the National Science Foundation and the Department of Energy as well as by internal grants from Virginia Commonwealth University (Offices of the President, Provost and Vice President of Academic Affairs, Vice President of Research, Vice Provost for Life Sciences, Dean of the College of Humanities and Sciences, and the Dean of the School of Engineering). The funding from NSF was used to support partial expenses of 12 invited speakers and 17 students and postdoctoral fellows.

Topics covered at the symposium

Clean and sustainable Energy: Production, Storage, Conversion, and Efficiency
Solar (Band-gap engineering and Material synthesis)
Wind (Tribology, Protective coating)
Biomaterials & Biofuel Technologies (Second- and Third- generation)
Hydrogen
Energy Storage Systems (nanostructured electrodes, batteries)
Thermo-electrics
Photothermal Energy Conversion

Environment: Atmospheric reactions, air and water purification and conservation,

Environmental remediation and Hydrocarbon processing

Health: Bio-materials, Diagnostics (sensors, image enhancement), Therapeutic (drug design and delivery, non-invasive cancer treatment), nano toxicity, safer-by-design.

Cross-cutting Topics: NanoCatalysis (new developments in core-shell catalysts, Fuel Cell and Environment Applications), Properties (Electronic, Optical, and Magnetic), hybrid nanoparticles, carbon nanostructures in all dimensions, polymer nanoparticles, and nanoparticle ferrofluids.

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