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Research Summary:

- Physical and chemical properties of supported metal clusters and cluster-based nanomaterials, optical properties of clusters and nanostructures.
- Nanocatalysis: Study of the size/shape/composition & function relationship at the sub-nanometer and nanometer scale, support effects in catalysis.
- Combined synchrotron X-ray scattering, X-ray absorption and mass-spectroscopy studies of nanocatalysts under realistic reaction conditions.
- Development of a unique experimental approach allowing in situ studies of size-preselected clusters under ambient conditions (high temperature, atmospheric pressure) by combining synchrotron X-ray scattering, X-ray absorption and mass-spectrometry.
- First demonstration of the use of size-preselected cluster based nanocatalysts in a for industry highly relevant catalytic process under realistic reaction conditions.
- Performing and understanding coherent laser control in small molecules and clusters by combining optimal control, pump & probe spectroscopy and theory.
- First ultrafast studies of solvent shell relaxation of water molecules in a confined space.

Honors and Recognition

- Recipient of a 2010 DAAD (German Academic Exchange Service) Award to participate in the Special Information Program: “Chemistry Research and Higher Education in Germany: Today’s Endeavor towards Green Chemistry”
- Member, Advisory Board of The Dekker Encyclopedia of Nanoscience and Nanotechnology, Marcel Dekker, Inc, New York, since 2009
- Invited chapters in “Femtochemistry” (Wiley 2001); “Femtochemistry and Femtobiology” (World Scientific 2003); Advanced Series in Physical Chemistry Vol.13, "Progress in Experimental and Theoretical Studies of Clusters“ (World Scientific, 2003) and in Dekker Encyclopedia of Nanoscience and Nanotechnology (Taylor & Francis 2009). Invited paper in Catalysis Today -topical issue on "Catalysis by Metals" (2010); Physical Chemistry Chemical Physics -invited feature article in themed issue "Recent

Developments in X-ray Absorption Spectroscopy" (2010), invited reviews for Progress in Surface Science (2011) and Catalysis Reviews (2011).
- Fulbright Fellowship to support a research stay with Prof. G. Fleming at the University of Chicago (1990).

Publications and Presentations
- More than 70 publications, including two in Science and Phys. Rev. Lett., and one in Angew. Chem. Int. Ed., Nano Letters and Nature Materials
- Over 100 invited talks