

UniCat Colloquium

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Lecturer: **Prof. Thorsten M. Bernhardt**, Deputy Director:
Institute of Surface Chemistry and Catalysis,
Nanocatalysis and Femtochemistry, Ulm University,
Germany

Title: **Selective oxidation catalysis
with metal clusters in an ion trap**

Abstract: Gas phase reaction kinetics measurements in a radio frequency ion trap setup under multi-collision conditions are applied to reveal the detailed mechanisms of the catalytic conversions as a function of the metal cluster size and composition.^{1,2} The experiments aim at one hand at providing conceptual mechanistic insight into well known heterogeneously catalyzed reactions. As an example, the low temperature CO combustion on small palladium clusters will be discussed.³ On the other hand, employing this gas phase technique, we recently discovered new catalytic routes that tackle the activation and selective oxidation of methane by employing free gold cluster cations.⁴⁻⁶ In both respects, small isolated metal clusters with accurately defined number of atoms can serve as effective and experimentally tractable model systems for such heterogeneous metal particle catalysts. One particularly important issue is the variable but limited size of isolated cluster complexes that also renders them ideally suited for detailed theoretical treatment, which in turn perfectly corroborates the intention to gain molecular level insight into catalytic processes.^{7,8}

1 T. M. Bernhardt, *Int. J. Mass Spectrom.*, 2005, 243, 1.

2 T. M. Bernhardt, J. Hagen, S. M. Lang, D. M. Popolan, L. Socaciu-Siebert, and L. Wöste, *J. Phys. Chem. A*, 2009, 113, 2724.

3 S. M. Lang, T. Schnabel, and T. M. Bernhardt, *Phys. Chem. Chem. Phys.*, 2012, 14, 9364.

4 S. M. Lang, T. M. Bernhardt, R. N. Barnett, and U. Landman, *Angew. Chem. Int. Ed.*, 2010, 49, 980.

5 S. M. Lang, T. M. Bernhardt, R. N. Barnett, and U. Landman, *J. Phys. Chem. C*, 2011, 115, 6788.

6 S. M. Lang, T. M. Bernhardt, R. N. Barnett, B. Yoon, and U. Landman, *J. Am. Chem. Soc.*, 2009, 131, 8939.

7 V. Bonačić-Koutecký and T. M. Bernhardt, *Phys. Chem. Chem. Phys.*, 2012, 14, 9252.

8 S. M. Lang and T. M. Bernhardt, *Phys. Chem. Chem. Phys.*, 2012, 14, 9255.

Date: **Wednesday, January 09, 2013**

Time: **5:15 pm - around 6:45 pm**

Location: **TU Berlin, Department of Chemistry
Straße des 17. Juni 115, 10623 Berlin
Building C, Lecture Hall C 264**

Organiser: **Prof. Helmut Schwarz (TUB)**

Coffee and tea will be served thirty minutes prior to the lecture start.

Guests are cordially invited to attend!

Prof. Dr. Matthias Driess, Chair of the Cluster of Excellence UniCat