

Department Chemie  
 Kolloquium für Physikalische und Theoretische Chemie  
**Monday, Feb. 4, 2013 at 16:15 – coffee served at the Cafeteria at 16:00**  
 Hörsaal 26411 (Science Cinema), Lichtenbergstr. 4, 85748 Garching

## **Aspects and prospects of '*in-operando*' magnetic-resonance investigations to study lithium-ion and metal-oxygen batteries**

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To develop energy storage devices with enhanced capacity, specific energy or improved cycle life, insights in the fundamental transport and transformation processes on an atomic scale are mandatory. For that purpose, nuclear magnetic resonance (NMR) and electron paramagnetic resonance (EPR) spectroscopy provide sensitive methods to study Li-diffusion, characterize the impact of aliovalent doping on the defect chemistry in Li-ion batteries and contribute to the understanding of working mechanism of the oxygen-reduction electrocatalyst in metal-air batteries. However, owing the reactive environment in a battery, the standard techniques of magnetic resonance need to be modified towards '*in-situ*' and '*in-operando*' setups. It will be discussed how advanced magnetic resonance experiments can aid in gathering insights into fundamental reaction mechanisms during battery operation and battery degradation.



Prof. Rüdiger-A. Eichel is director of the Institute of Energy and Climate Research – IEK-9: Fundamental Electrochemistry at the Forschungszentrum Jülich and holds a chair in Physical Chemistry at RWTH Aachen University. His research focuses on understanding fundamental processes and mechanisms of energy storage and conversion devices to design new materials. Prof. Eichel studied Physics at the University of Cologne and obtained his Ph.D. in Physical Chemistry from the Swiss Federal Institute of Technology (ETH) in Zürich in 2001. He then worked as a junior group leader at

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