B. M. Weckhuysen

*The author presented on this page has recently published his **25th article** since 2000 in Angewandte Chemie:* "X-ray Imaging of Zeolite Particles at the Nanoscale: Influence of Steaming on the State of Aluminum and the Methanol-To-Olefin Reaction": L. R. Aramburo, E. de Smit, B. Arstad, M. M. van Schooneveld, L. Sommer, A. Juhin, T. Yokosawa, H. W. Zandbergen, U. Olsbye, F. M. F. de Groot, B. M. Weckhuysen, *Angew. Chem.* **2012**, *124*, 3676–3679; *Angew. Chem. Int. Ed.* **2012**, *51*, 3616–3619.

Bert Weckhuysen

Date of birth:	July 27, 1968
Position:	Full Professor of Inorganic Chemistry and Catalysis at the Debye Institute for Nanomaterials Science, Utrecht University (The Netherlands), and Scientific Director of the Netherlands Institute for Research in Catalysis (NIOK)
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Education:	1986–1991 Masters degree in chemical and agricultural engineering, Katholieke Universiteit Leuven (Belgium) 1991–1995 PhD with R. A. Schoonheydt at KU Leuven 1995–1997 Postdoctoral Fellow with I. E. Wachs (Lehigh University, Bethlehem, USA) and J. H. Lunsford (Texas A&M University, College Station)
Awards:	**2002** VICI Research Award from the Netherlands Organization for Scientific Research (NWO); **2006** Gold Medal of the Royal Netherlands Chemical Society (KNCV); **2007** DECHEMA Award from the Max Buchner Research Foundation (Germany); **2009** Netherlands Catalysis and Chemistry Award; **2010** Elected Member of the European Academy of Sciences (Academia Europaea); **2011** Elected Member of the Royal Dutch Academy of Sciences (KNAW); P. H. Emmett Award in Fundamental Catalysis from the North American Catalysis Society (NACS); **2012** International Catalysis Award from the International Association of Catalysis Societies (IACS); V. N. Ipatieff Lectureship at Northwestern University (USA)
Current research interests:	Development and use of spatiotemporal characterization methods applied to heterogeneous catalysts during catalyst preparation and operation; structure–activity relationships for catalytic processes that produce bulk chemicals and energy carriers; catalytic conversion of conventional and nonconventional feedstocks
Hobbies:	Music, photography, enjoying a good meal and a glass of wine, and playing with my son and daughter

If I were not a scientist, I would be … an artist.

My favorite band is … Coldplay.

The most important thing I learned from my parents is … to be yourself all the time.

If I could have dinner with three famous scientists from history, they would be … Michael Faraday, Galileo Galilei, and Thomas Edison.

My favorite place on earth is … a hill or mountain where you have a beautiful view of the surrounding world.

The most exciting thing about my research is … that it is of fundamental importance, but also has practical relevance, as knowledge of the function of catalytic materials may finally end up in industrial applications.

My biggest motivation is … twofold. On one hand, I wish to progress catalysis research as I truly believe that once we can understand heterogeneous catalysis, we could tailor a particular catalyst for a new chemical process. On the other hand, I enjoy seeing my PhD students and postdoctoral fellows grow and make their own way in their career.

The best advice I have ever been given is … to develop your own line of research in a consistent manner; to refresh your way of thinking when you are making your own scientific path.

The worst advice I have ever been given was … to chop a specific research article into two papers; you learn from your mistakes as it is much more rewarding to combine different pieces of the puzzle in one coherent scientific story.

My favorite author is … Willem Elsschot, a Flemish writer and poet, which is the pseudonym of Alphonsus Josephus de Ridder. Elsschot wrote very intriguing and entertaining books, such as *Lijmen* (*Soft Soap*) and *Het Been* (*The Leg*).

My top three films of all time are … Le Fabuleux Destin d'Amélie Poulain, The Silence of the Lambs, and The Shawshank Redemption.

My favorite food is … Japanese, so I am always looking forward to attending a conference in Japan.

How has your approach to chemistry research changed since the start of your career?

During my PhD, I explored the surface chemistry of heterogeneous catalysts under hydrating, dehydrating, or reducing conditions by using different methods. However, it felt like studying the "prenatal" and "postmortem" states of catalyst materials. During my postdoctoral stays, I became convinced that much more could be learned by investigating real-life catalysts under realistic conditions. By doing so, it is possible to better understand the working principles of heterogeneous catalysts and come up with guidelines to make better ones. This has motivated me to set up a research group that is fully devoted to pushing the field of in situ spectroscopy of catalytic solids. This research area really developed in the last decade and I am amazed what we already can do; for example, watching single molecules at the nanoscale in real time when travelling throughout a catalytic material and later on being converted into other molecules.

How do you think your field of research will evolve over the next 10 years?

It is difficult to predict the future, but it is clear that spatial, temporal, and energy resolution has to be further improved in order to obtain the finest details of the chemical reactions taking place within a catalytic solid. Furthermore, these improvements will allow us to fully grasp in three dimensions the dynamic behavior of a real-life catalyst at work, as well as to understand the intricate organic–inorganic interactions taking place when molecules are converted within, for example, a nanoporous solid. In this way, can we better understand the concepts behind catalyst selectivity, activity, and stability? We can also expect that more microspectroscopic methods will be combined in one setup, such as a combination of electron, scanning probe, and optical microscopies, thus guaranteeing that the "same" material is investigated under "identical" reaction conditions. Finally, other research fields such as earth sciences may benefit from these technical developments.

My 5 top papers:

1. "Catalytic Activity in Individual Cracking Catalyst Particles Imaged Throughout Different Life Stages by Selective Staining": I. L. C. Buurmans, J. Ruiz-Martínez, W. V. Knowles, D. van der Beek, J. A. Bergwerff, E. T. C. Vogt, B. M. Weckhuysen, *Nat. Chem.* **2011**, *3*, 862–867.
   The first application of selective staining of the catalytically active component within an industrially applied catalyst material, namely a fluid catalytic cracking catalyst. Important differences are noted between catalyst materials that are deactivated according to distinct industrial protocols. The approach reveals both intraparticle and interparticle heterogeneities in Brønsted acidity.
2. "The Catalytic Valorization of Lignin for the Production of Renewable Chemicals": J. Zakzeski, P. C. A. Bruijnincx, A. L. Jongerius, B. M. Weckhuysen, *Chem. Rev.* **2010**, *110*, 3552–3599.
   This review article gives a comprehensive overview of the catalytic lignin valorization literature. Lignin is sometimes called "the forgotten biomass" as it is a biomass component that is hard to convert. However, I consider it essential to discover innovative catalytic routes to efficiently convert lignin into useful chemicals. In this way, one can start thinking of fully integrated biomass refineries for the coming decades.
3. "Morphology-dependent Zeolite Intergrowth Structures Leading to Distinct Internal and Outer-Surface Molecular Diffusion Barriers": L. Karwacki, M. H. F. Kox, D. A. M. de Winter, M. R. Drury, J. D. Meeldijk, E. Stavitski, W. Schmidt, M. Mertens, P. Cubillas, N. John, A. Chan, N. Kahn, S. R. Bare, M. Anderson, J. Kornatowski, B. M. Weckhuysen, *Nat. Mater.* **2009**, *8*, 959-965.
   This article fully illustrates the complexity of zeolite crystals, even if they are beautifully shaped and perfect at first glance. The complex intergrowth structure of an industrially important zeolite crystal, namely ZSM-5, is elucidated, thus providing evidence for the presence and nature of internal and outer-surface barriers.
4. "Chemical Imaging of Spatial Heterogeneities in Catalytic Solids at Different Length and Time Scales": B. M. Weckhuysen, *Angew. Chem.* **2009**, *121*, 5008–5043; *Angew. Chem. Int. Ed.* **2009**, *48*, 4910–4943.
   This Review brings together reported data on spatiotemporal gradients that take place within catalytic solids when they are prepared or functioning. These heterogeneities simultaneously occur at different length scales.
5. "Nanoscale Chemical Imaging of a Working Catalyst by Scanning Transmission X-ray Microscopy": E. de Smit, I. Swart, J. F. Creemer, G. H. Hoveling, M. K. Gilles, T. Tyliszczak, P. J. Kooyman, H. W. Zandbergen, C. Morin, B. M. Weckhuysen, F. M. F. de Groot, *Nature* **2008**, *456*, 222–225.
   The label-free spectroscopic characterization of an industrially relevant heterogeneous catalyst at the nanoscale during CO hydrogenation at elevated temperatures. For our research group, it was the starting point to fully explore the capabilities of X-ray microscopy and tomography to investigate catalytic solids at work.

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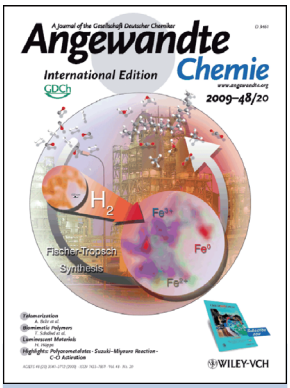

The work of B. M. Weckhuysen has been featured on the cover of Angewandte Chemie:
"Nanoscale Chemical Imaging of the Reduction Behavior of a Single Catalyst Particle": E. de Smit, I. Swart, J. F. Creemer, C. Karunakaran, D. Bertwistle, H. W. Zandbergen, F. M. F. de Groot, B. M. Weckhuysen, *Angew. Chem.* **2009**, *121*, 3686–3690; *Angew. Chem. Int. Ed.* **2009**, *48*, 3632–3636.