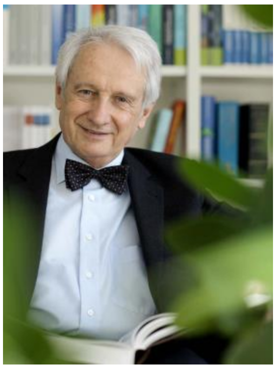
東京大学
微細構造解析
プラットフォーム
The University of Tokyo

# 東京大学微細構造解析プラットフォーム
# 公開講演会

## "Finding the atomically resolved shape of a nanoparticle by aberration-corrected transmission electron microscopy"

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Abstract

Spherical-aberration corrected optics is ubiquitous in modern electron microscopy. Record resolutions around 50 pm have been achieved in structural investigations in both TEM and STEM mode and the precision at which a particular atom position can be measured has reached picometer values. This allows genuine atomic resolution. In general, however, this is realized as lateral (x,y) resolution or precision only. Finding the position of a given atom along the third dimension (z; the 'viewing' direction) is more difficult. An extreme case, e.g. interesting in catalysis, is the determination of the three-dimensional (3D) shape of a nanoparticle with single-atom precision. This includes the problem to differentiate between individual atoms situated at the top or at the bottom surface.

Exploiting the high depth sensitivity of contrast in TEM mode, which in this case is a particular advantage, we have recently been able to derive the atomically resolved 3D shape of a MgO nanoparticle from a single micrograph [1]. This includes the solution of the problem whether a particular atom is located at the top or the bottom surface of the particle. This technique relies on recent advances in quantitative image recording and contrast calculations permitting a fit of calculated to experimentally measured atom contrast values on an absolute scale. The starting point is provided by the use of the NCSI technique yielding high signal-to-noise ratio images. The primary image data are refined by consideration of, e.g., the MTF of the CCD camera, unavoidable specimen tilt and residual lens aberrations. This drives the sensitivity to such high values that not only the atom-by-atom structure of the top and bottom surfaces can be determined separately. In addition surface adsorbates can be detected by the contrast anomalies created by these.



[1] C.L. Jia, et al, Nature materials 13, 1044 (2014).


**March 17 (Tue), 2015  14:00～15:30**
**Main meeting room at Institute of Engineering Innovation, UT**
**(工学部総合研究機構　９号館１階　大会議室)**
**Organizer: Prof. Yuichi Ikuhara  Phone: 03-5841-7688**