Stuttgarter Physikalisches Kolloquium

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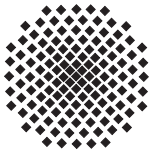

Dienstag, 7. Januar 2020	16.15 Uhr	Hörsaal 2D5

Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

Development of low-voltage TEM/STEM for single-atom imaging and spectroscopy

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Abstract

In this presentation, our recent developments of low-voltage In this presentation, our recent developments of low-voltage TEM/STEM with the JEOL ltd. will be overviewed. Several examples for single atom spectroscopy by means of core-level EELS will be demonstrated to discriminate individual atoms in low-dimensional materials at their interrupted periodicities. It is emphasized here that information of the bonding/electronic states has become accessible for single atoms through the EELS fine-structure analysis [1] as well as the spin state [2]. Large variations of local electronic properties of 1D and 2D materials with different atomic coordinates will be shown [3]. Such an analysis was applied to understand catalytic behavior of Co doped MoS2 for hydrodeoxygenation reaction [4]. Furthermore, a high-energy resolution EELS with the double-Wien filter-type monochromator offers us possibilities to obtain local optical/vibrational properties[5]. Some of the recent examples for such experiments on low-dimensional nanomaterials will be also presented [6].

[1]. Y.-C. Lin et al., *Nano Letters*, **15** (2015) 7408-7413; L. Tizei et al., *Phys. Rev. Lett.*, 114 (2015) 197602; R. Senga et al., *Nature Mat.*, **13** (2014) 1050
[2]. Y.-C. Lin et al., *Phys. Rev. Lett.*, **115** (2015) 206803
[3]. Y.-C. Lin et al., *Nano Lett.*, **17** (2017) 494-500; R. Senga and K. Suenaga, *Nature Communications*, (2015) 6:7943
[4]. G. Liu et al., *Nature Chem.* **9** (2017) 810
[5]. J. Lin et al., *Nano Lett.*, **16**, (2016); 7198-7202, L. Tizei et al., *Phys. Rev. Lett.*, **114** (2015) 107601; R. Senga et al., *Nano Lett.*, **16**, (2016) 3661-3667; R. Senga et al., *Nano Lett.*, **18**, (2018) 3920-3925
[6]. R. Senga et al., *Nature* **573** (2019) 247-250; J. Hong et al., (submitted)
[7]. This research was supported by JST-CREST and JSPS KAKENHI (JP16H06333).