1 & 2DM Conference and Exhibition
January29-30, 2019

Kazu Suenaga
Yung-Chang Lin, Junhao Lin, Luiz Tizei, Zheng Liu and Ryosuke Senga
AIST, Central 5, Tsukuba, Japan

suenaga-kazu@aist.go.jp

Structures and propertiesof one-dimensional materials

One-dimensional materials can be as small as a single atom in width and are the simplest possible orderable structures, which makes them ideal platforms for the study of fundamental properties of matter [1]. Analytical technique at single atom level is crucial to diagnose the atomic structures of one-dimensional materials and then to predict their physical/chemical performance. In my presentation, single atom imaging and spectroscopy by means of electron energy-loss spectroscopy (EELS) inside TEM/STEM will be shown to discriminate individual atoms in one-dimensional materials. Examples for intriguing physical phenomena from this emerging class of materials, such as Peierls distortions [2, 3], phase changes [4, 5],structural confinements [6, 7], will be presented. Also their transport or optical properties are attempted to correlate with their atomic structures [4, 8, 9].

References

[1] J. Sloan in Warwick Physics Day, July 2019
[2] Y.-C. Lin et al., *Nano Lett.,* 17 (2017) pp.494-500
[3] H. Komsa et al., *Nano Lett.,* 17 (2017) pp.3694-3700
[4] J. Lin et al., *Nature Nanotech*., 9 (2014) 436
[5] L. Tizei et al., *Phys. Rev. Lett.*, 114 (2015) 197602,
[6] R. Senga et al., *Nature Materials*, 13 (2014) 1050, R. Senga et al., *Nature Comm*., 6:7943(2015)
[7] Z. Liu et al., *Nature Comm*., 2:213(2011)
[8] R. Senga et al., *Nano Lett.*, **16**, (2016), 3661-3667
[9] Y.-C. Lin et al, *Adv. Funct. Mater.* (2017) 1704210
[8] This research was supported by JSPS KAKENHI (JP16H06333).

Figures

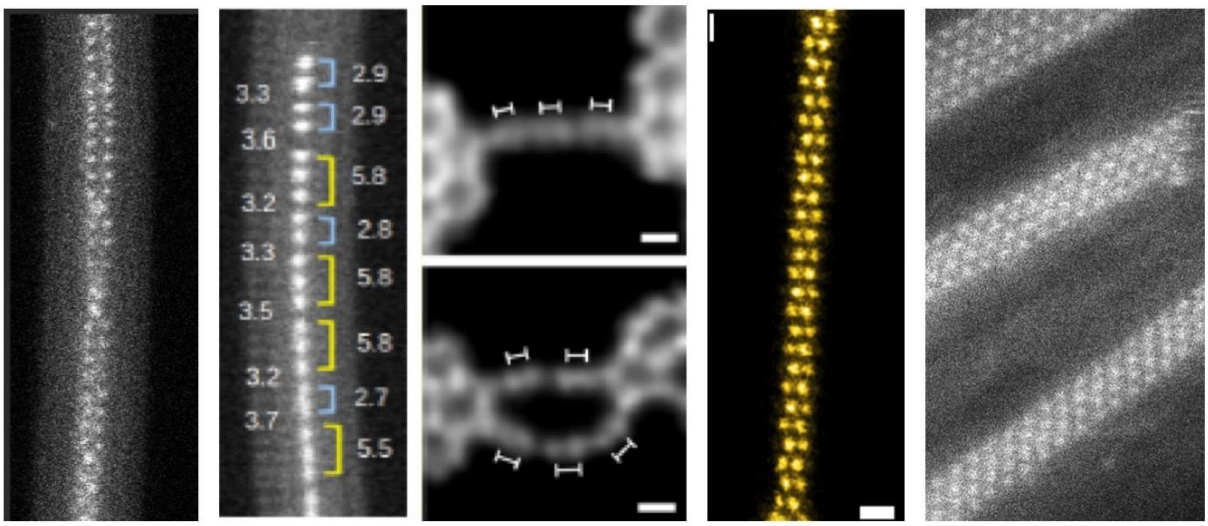

Figure 1: Examples for one-dimensional structures: (Left to right) Eu double atomic chains, iodine mono-atomic chains, carbon chains, MoSe nanowire, WS_2 nanoribbons.