The 35th Nanotechnology Seminar

聴講歓迎

■ 6月6日（木） 15：00～16：15

■ グローバルイノベーションセンター 3階 研修室

GIC Global Innovation Center

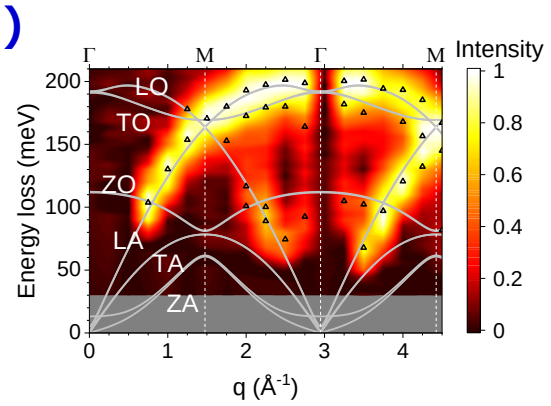
15:00-15:45

「Optical and vibrational EELS from low-dimensional materials in TEM」

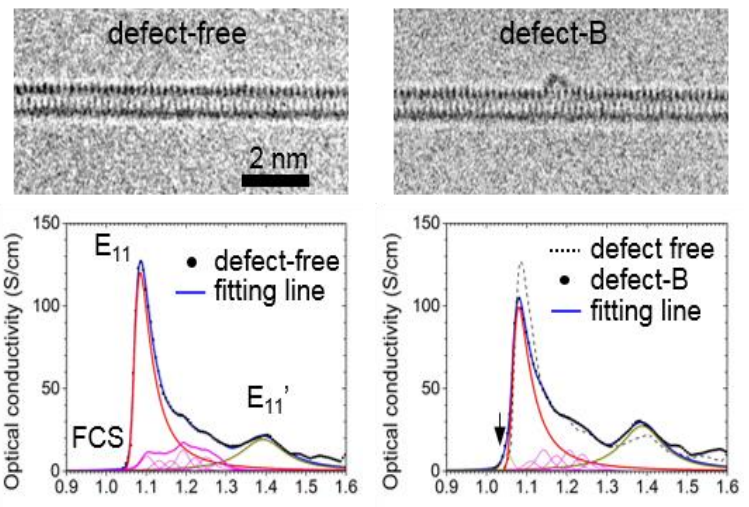
末永 和知 首席研究員 （産業技術総合研究所 ナノ材料研究部門）

Electron energy-loss spectroscopy (EELS) has been widely used for elemental identification in transmission electron microscopes (TEM) by using core-level excitations. Recent developments of monochromators after the e-beam guns has enabled us to access optical and vibrational ranges in the valence EELS regions from nanometric materials. Contrary to the core-level EELS, the valence EELS has a considerable delocalization effect which makes the local measurements intrinsically difficult. Here we show our continuous studies to develop the possibilities of valence EELS on low-dimensional materials. Attempts involve the local optical measurements of carbon nanotubes with atomic defects [1,2], TMDC with various morphologies [3,4], and individual quantum dots [5]. We will also show our challenge to use a TEM as a full phonon spectrometer with a nanometer spatial resolution even for apolar materials [6].

[1] R. Senga et al., *Nano Lett.*, **16**, 3661 (2016)
[2] R. Senga et al., *Nano Lett.*, **18**, 3920 (2018).
[3] Y.-C. Lin et al, *Adv. Funct. Mater.*, 1704210 (2017).
[4] P. Gogoi et al., submitted.
[5] J. Lin et al., *Nano Lett.*, **16**, 7198 (2016).
[6] R. Senga et al., submitted.



Phonon measurement of graphene inside a TEM

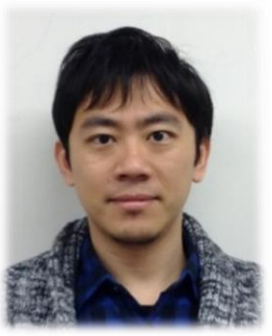


Exciton measurement near defects of a carbon nanotube

15:45-16:15

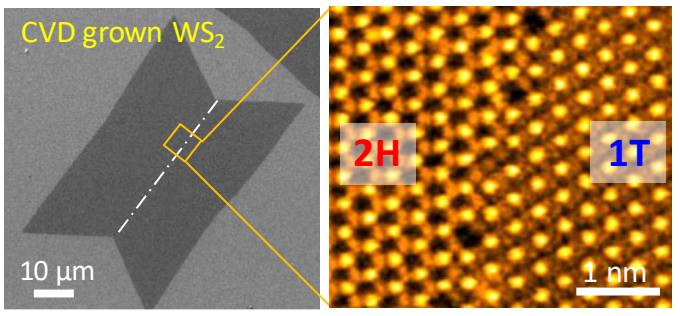
「Characterization of 2D dimensional materials with the low-voltage STEM and EELS」

Yung-Chang Lin (林永昌) 博士（産業技術総合研究所 ナノ材料研究部門）

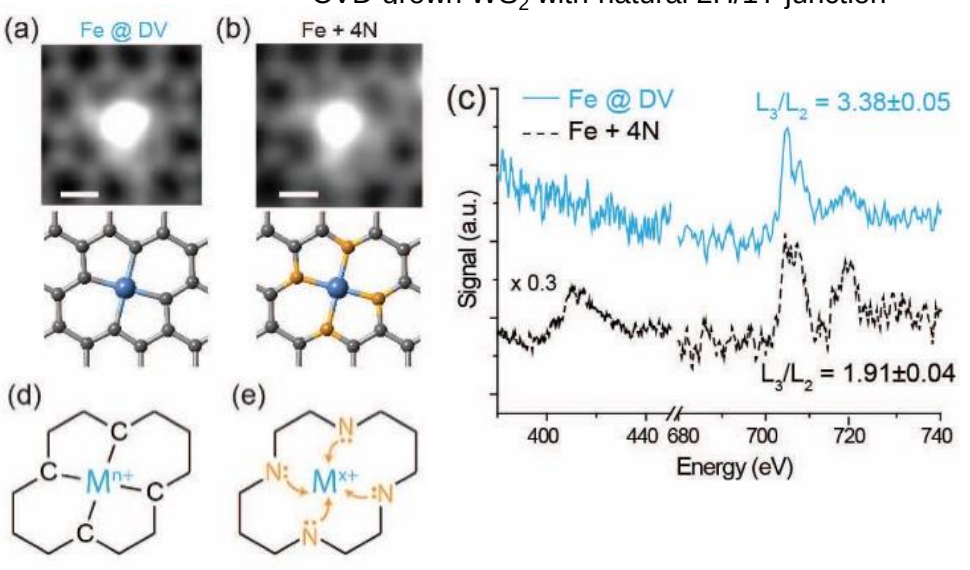


Aberration corrected scanning transmission electron microscopy (AC-STEM) is one of the most powerful facility for the structure characterization of nanomaterials at atomic precision. Two dimensional materials such as graphene, BN, and transition metal dichalcogenides (TMDCs) not only possess intriguing physical properties but also provide ideal playgrounds for scientists to manipulate the electronic properties atom-by-atom. In this presentation, we will present the discovery and identification of polymorphous of group 6 TMDCs [1], and introduce how to manipulate defect and phase transformation under electron beam [2,3]. We will also present the existence of nitrogen in graphene and how does the nitrogen atom influence the spin state of single transition metal atom in graphene [4,5].

[1] Y.C. Lin et al., *ACS Nano,* **12**, 12080 (2018).
[2] Y.C. Lin et al., *Nature Commun.,* **6**, 6736 (2015).
[3] Y.C. Lin et al., *Nature Nanotechnol.*, **9**, 391 (2014).
[4] Y.C. Lin et al., *Nano Lett.*, **15**, 7408 (2015).
[5] Y.C. Lin et al., *Phys. Rev. Lett.*, **115**, 206803 (2015).



CVD grown WS_2 with natural 2H/1T junction



Control the spin-state of a single Fe atom in graphene by nitrogen atom

連絡先：グローバルイノベーションセンター 吾郷 （**h-ago@gic.kyushu-u.ac.jp**）