Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Influence of Carbon Curvature on Nano-Structured Graphenes: 3D Force Field Spectroscopy Study MAKOTO ASHINO, University of Hamburg and Kanazawa Inst.Technol., NARUO SASAKI, Seikei University, ROLAND WIESENDANGER, University of Hamburg — The electronic and mechanical properties of two-dimensional graphene membranes are substantially modified by bending in the nanometer-scale range. The response of chemical bonds to bending deformation leads to deviation from the plate idealization [1]. Side wall of the carbon nanotube, the rolled-up form of graphene in nanometer-scale diameter, is regarded as one of the well-defined analogues of curved graphenes. In our study, three-dimensional force field spectroscopy, based on frequency-modulation atomic force microscopy (FM-AFM), has been carried out on single-walled carbon nanotubes (SWNTs) with different diameters to investigate how surface potential and mechanical properties of graphene sheets would alter with their local curvature. The diameters as well as chiral indices of the individual SWNTs have been specifically determined by Raman spectroscopy and FM-AFM imaging. We have found that the binding energy and spring constant at the individual carbon sites would increase with the curvature, showing good agreement with theoretical analyses on the curvature-induced shift in sp^2 hybridization (i.e. σ-π rehybridization) [1,2]. In our talk, we will discuss on details of our experimental results.

[1] D.-B. Zhang *et al.*, Phys. Rev. Lett. **106**, 255503 (2011).
[2] M. K. Kostov *et al.*, Phys. Rev. Lett. **89**, 146105 (2002).

Makoto Ashino
University of Hamburg and Kanazawa Inst. Technol.

Date submitted: 09 Jan 2014 Electronic form version 1.4