CO$_2$ adsorption on single-walled dahlia-like carbon nanohorns

JAIME BOHORQUEZ, VAIVA KRUNGLEVICIUTE, ALDO MIGONE, Department of Physics, Southern Illinois University, MASAKO YUDASAKA, SUMIO IIJIMA, National Institute of Advanced Industrial Science and Technology — The adsorption of CO$_2$ on spherical aggregates of as-produced (i.e., closed) dahlia-like single-walled carbon nanohorns was investigated. We conducted volumetric adsorption measurements at five temperatures between 147 and 180 K. The shape of the isotherms for CO$_2$ is very different from those measured with neon and CF$_4$. For CO$_2$ there is a single, smeared step in the adsorption data between the lowest coverages and saturation. By contrast, Ne and CF$_4$ show two distinct substeps on the same substrate. The isosteric heat was also obtained and its dependence on coverage also showed an usual behavior: it increased with increasing coverage. The isosteric heat decreases with coverage both for Ne and CF$_4$. The stronger intermolecular interactions present for CO$_2$ probably are responsible for this adsorbate’s unusual behavior. Comparisons with the behavior reported in the literature for CO$_2$ on SWNTs, which shows similar unusual characteristics, will also be made.

$^1$This research supported by NSF grant # DMR-0705077.