東京大学大学院工学系研究科専攻間横断型教育プログラム
「機械システム・イノベーション」

東京大学 THE UNIVERSITY OF TOKYO

GMSI

PCIL Practice to Cultivating Innovation Leader

# 第141回 公開セミナー/第50回実践リーダーレクチャー

## Chiral-Control Growth of Carbon Nanotubes: Achievements and Challenges


## Dr. Avetik R. Harutyunyan

Materials Science Division,
Honda Research Institute USA Inc.


**日時：平成25年9月24日（火） 10：00～11：30**
**会場：東京大学工学部2号館 3階 31A会議室**

## 要旨


Carbon nanotubes continue to surprise with unprecedented applications [1-3]. Yet, the lack of homogeneous single walled carbon nanotube (SWNT) product became a major obstacle that hinders their broad application. The main challenge remains the knowledge of carbon nanotube formation mechanism, which despite two decades of extensive efforts is not fully understood yet. The origin of this challenge is related to the broad diversity of energetically close nanotube structures that can be transformed from one to each other by small structural perturbation. In this regard, understanding the very early stage of nucleation when the chirality is set becomes a crucial event in nanotube growth. The catalyst particle plays key role [4], especially taking into account the possible epitaxial relationship between catalyst facet structure and grown carbon nanotube chirality. Recent successes on selective growth of
SWNTs by tuning of catalyst particle morphology [5] partially support this hypothesis. In the meantime in the course of in situ environmental scanning/transmission electron microscope studies we observe that carbon cap nucleation and following lift off from catalyst surface were accompanied by the remarkable reconstruction of catalyst surface structures [6] via step motion mechanism. This fact makes controllable growth even more challenging. The thermodynamics and kinetics of various nucleation mechanisms of carbon nanotubes on metal clusters and their implications for the controllable growth will be discussed.



1. G. Chen et al., Sci. Reports 2:343/DOI:10.1038/srep00343 (2012)
2. G. Chen et al., Appl. Phys. Lett. 101, 053119 (2012)
3. R. Rao et al., Sci. Reports 3:1891/DOI/10.1038/srep01891 (2013)
4. A.R. Harutyunyan J. Nanosci. Nanotechnol. 9, 2480 (2009)
5. A.R. Harutyunyan et al., Science 326, 116 (2009)
6. E. Pigos et al, ACS Nano 5, 10096 (2009)



主催： 東京大学大学院工学系研究科「機械システム・イノベーション」プログラム
東京大学 実践型リーダー養成事業「イノベーションリーダー養成演習」（PCIL）
本件連絡先： 東京大学大学院工学系研究科機械工学専攻 教授 丸山 茂夫
E-mail: maruyama@photon.t.u-tokyo.ac.jp Phone: 03-5841-6421
GMSIプログラム事務局 E-mail: gmsi-office@pcil.t.u-tokyo.ac.jp Phone: 03-5841-0696