The collaboration research for the Dual Graduate School between VNU and JAIST

[Title of collaboration research]:

Metal cluster growth on carbon nanotubes

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[Reference home-page address]:

http://www.jaist.ac.jp/~kkgi/thisyear/soj/00295soj.html.

http://www.jaist.ac.jp/~kkgi/thisyear/soj/00417soj.html.

http://www.jaist.ac.jp/~fujiwara/index.html

[Other references]:

[Contents]

Recently, growth of precisely size-controlled platinum clusters on multi wall carbon nanotube (MWCNT) supports was succeeded as shown in Fig. 1 [1]. Clusters are uniformly grown on MWCNTs from metal atoms to a few nanometers clusters and are very stable on MWCNTs in spite of their small sizes. Therefore, these materials are regarded as potential materials for catalysis for fuel cells. This research will be developed both to basic and application researches, as follows: (1) Elucidation of growth mechanism of metal clusters, (2) Application of other materials to this methods to form new clusters, (3) Characterization of metal clusters fabricated by this methods, (4) Development of fuel cell with metal clusters fabricated by this method. Although Pt acts as a catalyst of fuel cell, Pt is precious materials and very expensive. Therefore, development of catalysts with abundant materials such as 3d-metals will contribute to the reduction of worldwide energy problem.

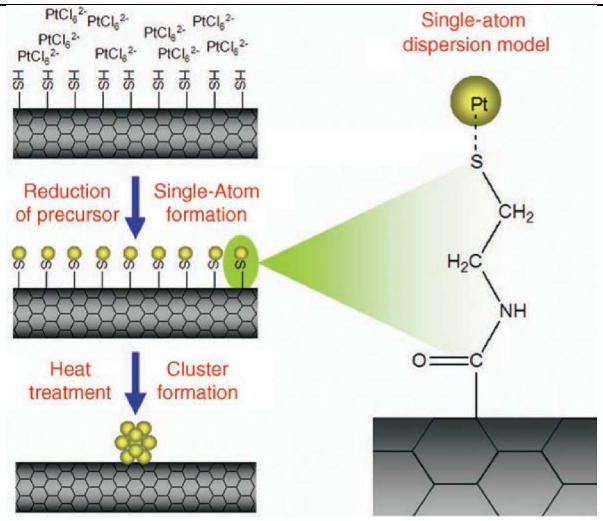

Fig.1. Schematic of the single-atom to cluster (SAC) approach to fabricate fine size-controlled clusters.

In this research we will systematically proceed above-mentioned research by experimental and theoretical approaches. In the experimental approach, purification of MWCNTs, fabrication of clusters on MWCNTs, characterization by XRD, TEM, XPS, EXAFS, and fabrication of fuel cells will be performed. In the theoretical approach, the first principles calculations based on the Density Functional Theory (DFT) will be main technique in this research and the molecular dynamics simulations will be also carried out for investigation of reaction process.

[1] Y. –T. Kim et al., “Fine size control of platinum on carbon nanotubes: from single atom to clusters”, Angew. Chem. Int. Ed. **45**, 407-411 (2006).