

学位論文の審査結果の要旨

The title of the thesis is “Carbon materials supported metal nanostructures for efficient catalytic organic transformations”. It contains totally seven chapters. In the first chapter, the student briefly has written the introduction of the work. In the introduction part (chapter 1), the importance and aim of the work are discussed well enough. The use of the carbon materials as a supports has been described well. Also, the importance of the catalytic reactions and the drawback existing in the previously reported work are also well mentioned. I would say the motivation of the proposed work is good. In the second chapter, CuO/MWCNT composite is prepared by a simple synthesis and the composite material is used as a catalyst for the arylation reactions. Similarly, RuO₂ particles decorated on SWCNTs for Heck coupling reactions. Reduction reactions have been carried out on the GNPs-RuNRs catalyst and the results are presented in chapter 4. In the fifth chapter, GNS-RuNPs composite material was prepared and the composite material was used for the aerial oxidation of alcohols. The mechanism of the catalytic reactions also well explained and presented nicely. In the sixth chapter, RuO₂NPs anchored GNPs catalyst (GNP-RuO₂NPs) is highly efficient for the *N*-oxidation of tertiary amines. Finally, conclusion is written. In all the chapters, the discussion of the results is well. Apart from theses all, these results are published in high impact journals such as Journal of Physical Chemistry C, Carbon and Catalysis Science and Technology, some of them are under revision in high impact journals such as ACS Catalysis and Catalysis Science and Technology. The publications too show the merit and standard of the work. Overall the thesis is well written.

公表主要論文名

- [1] **M. Gopiraman**, S. Ganesh Babu, Z. Khatri, K. Wei, YA. Kim, M. Endo, R. Karvembu, IS. Kim, “Dry Synthesis of Easily Tunable Nano Ruthenium Supported on Graphene: Novel Nanocatalysts for Aerial Oxidation of Alcohols and Transfer Hydrogenation of Ketone” *Journal of Physical Chemistry C* 117 (2013) 23582–23596.
- [2] **M Gopiraman**, SG Babu, Z Khatri, W Kai, YA Kim, M Endo, R Karvembu, IS Kim, “An Efficient, Reusable Copper-oxide/Carbon-nanotube Catalyst for N-arylation of Imidazole” *Carbon* 62 (2013) 135–148.
- [3] **M Gopiraman**, SG Babu, Z Khatri, K Wei, E Morinobu, R Karvembu, IS Kim, “Facile and Homogeneous Decoration of RuO₂ Nanorods on Graphene Nanoplatelets for Transfer Hydrogenation of Carbonyl Compounds” *Catalysis Science and Technology* 3 (2013) 1485–1489.