論 文 内 容 の 要 旨

My research is focused on two main objectives, the preparation and characterization of carbon materials (CMs) supported metal nanostructures (MNSs), and apply them to catalyze various organic transformations.

A very simple and cost-efficient "dry synthesis" method has been used to decorate the MNSs over CMs. Copper oxide nanoparticles (CuONPs) have been successfully decorated on multi-wall carbon nanotubes (MWCNTs) using copper acetate precursor, and was used as a heterogeneous nanocatalyst (CuO/MWCNT) for the N–arylation of imidazole. In the same way, ultrafine ruthenium dioxide nanoparticles (RuO$_2$NPs) with mean diameter of 0.9 nm have been decorated on single-walled carbon nanotubes (SWCNTs), and used as a nanocatalyst (RuO$_2$/SWCNT) for the Heck-type olefination of aryl halides under mild reaction conditions. For the transfer hydrogenation of aromatic aldehydes and ketones, graphene nanoplatelets (GNPs) supported ruthenium oxide nanorods (RuNRs) catalyst was found to be an effective and reusable heterogeneous catalyst. Alike, ruthenium nanoparticles (RuNPs) have been decorated on graphene nanosheets (GNS), and the resultant material has been used as a nanocatalyst

(GNS-RuNPs) for the aerial oxidation of alcohols. It was found that, RuO_2NPs anchored GNPs catalyst (GNP-RuO_2NPs) is highly efficient for the *N*-oxidation of tertiary amines. Before going for the catalytic applications, all the prepared nanocatalysts are characterized in detail by various microscopic and spectroscopic techniques. The morphology and particles size of the metal nanostructures (MNSs) have been investigated by HR-TEM and TEM techniques. SEM-EDX and ICP-MS are taken to determine the factual weight percentage of the metals loaded in nanocatalysts. Raman spectroscopy has been recorded to study the nature of interaction between MNSs and CMs. Chemical states of the MNSs in nanocatalysts have been identified by XPS and XRD techniques. In all the catalytic systems, initially, reaction condition is optimized and then the substrate scope of the catalytic system has been extended. Chemoselectivity, regioselectivity, heterogeneity and reusability tests have been performed. GC is recorded to calculate the conversion and selectivity of the reactants and products, respectively. Catalytic products have been analyzed by ^1H and ^{13}C NMR, FT-IR and Mass spectra. In order to reveal the physical as well as chemical stability, after the completion of catalytic reactions, the nanocatalysts are separated out from the reaction mixture and analyzed by TEM, XRD, Raman and SEM-EDS. Here, it is worth mentioning that, after the catalytic reactions, MWCNTs and GNPs supporters have been successfully recovered from the used nanocatalysts (*u*-CuO/MWCNT or *u*-GNPs-RuNRs) and confirmed by TEM, Raman and WAXD.