

**NUS Graduate School for Integrative Sciences and Engineering
Research Project Write-up**

Title of Project : Nanostructured Materials for Photocatalytic Reactions (Solar Energy Utilization)

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Short Description

Over the past decade, nanotechnology has shed new light on design and synthesis of catalytic materials. In this regard, a practical solid catalyst is normally not a simple chemical compound, but a highly organized multi-component materials system. With this modern view, an organized assembly of catalytic materials can be considered as a “smart catalyst device” in nanometric scale, and the ways of chemical and structural organizations in the device will give profound impacts on its ultimate performance. This project will look into some fundamental issues in synthesis and organization of photosensitized metal oxide nanomaterials. To make organized nanomaterials usable in real reaction environments, organization of inorganic (such as metals and metal oxides, etc) nanostructures with permanent engagement among the primary building units will be carried out in a controllable manner. Furthermore, active metal catalysts (such as Au and Co, etc) will be distributed on the exterior surfaces or introduced to the interior spaces of these devices (i.e., nanoreactors). For example, preparation, size-manipulation, surface functionalization, photocatalytic reactions, and reactivation of catalytic nanoparticles inside the devices will be investigated, through which the student will learn basic processes for preparation of nanomaterials, and develop novel chemical processes enabled by nanotechnology.