Tailoring of Photocatalysis: Combining Controlled-Size Nanoparticles and Mesoporous Oxide Nanostructures Towards High Photocatalytic Activity and Selectivity

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Billions of dollars are investigated into information industry. Its less known, that similar budget is used for planning catalysis and environmental as well as industrial catalytic processes. The increasing demand for high activity and selectivity of the high performance oxidation processes needs new technologies and understanding of heterogeneous catalysis. The former trial-and-error method can be exchange with new techniques using in-situ methods for molecular level understanding under reaction conditions as well as controlled nanotechnology. These techniques may be exploited in high performance oxidation processes for water as well as gas treatments.
In our research, mono and bimetallic nanoparticles with controlled average sizes were synthesized and were anchored onto different 3D mesoporous oxide materials (SiO_2 – MCF-17, SBA-15, Co_3O_4, MnO_2, Fe_2O_3, NiO, CeO_2) with high surface area and controlled pore structure prepared by the soft and hard template (replica) method. Tuning the size of the particles as well as the oxide/metal interfaces high activity and selectivity processes are favorable. We tested these tailored nanostructures in several photocatalytic processes such as UV light sensing, UV-light as well as VIS-light assisted water treatment.

Keywords: Pt Nanoparticles, Controlled size, Mesoporous Oxide, Hard template – Replica Method, Heterogeneous Photocatalysis