

ICB PhD public presentations

ENSEMBLE DESIGN FOR SELECTIVE HYDROGENATION CATALYSTS

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Project Summary: Heterogeneously-catalyzed selective hydrogenations are widely applied in the preparation of numerous commodity and fine chemicals. Archetypal catalysts for these reactions are based on noble metals partially deactivated with selectivity enhancers such as lead or vanadium. This thesis stems from the quest of tackling the low metal utilization and presence of toxic additives in traditional systems by designing innovative catalyst architectures based on supported ligand-modified metal nanoparticles, single atom heterogeneous catalysts, p-block modified noble metals, and metal oxides that integrate selective and stable ensembles. The performance is evaluated in various relevant gas- and liquid-phase applications including alkyne semi-hydrogenation and conversion of levulinic acid to γ -valerolactone. Particular emphasis is placed on identifying the pillars governing activity, selectivity, and stability and understanding their complex interplay through the combination of precise material syntheses, in depth characterization, and detailed catalytic and kinetic tests aided by theoretical simulations.

CV. Davide graduated in 2014 with an MSc in Industrial Chemistry at the University of Milan. In 2014 he started his PhD under supervision of Prof. Dr. J. Pérez-Ramírez at ETH Zurich.