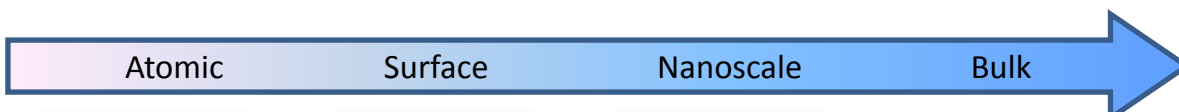


Advanced catalyst characterization via *in-situ* capabilities

Recent catalyst research has been focused on the structure and kinetics of working catalysts *under dynamic reaction conditions*. This is to better understand the actual structure-activity/selectivity relationships in catalysis. The development of this work will provide critical insight into surface-bulk mobility issues, structural transformation and stability of catalysts under working conditions.

In-situ characterization technique is a powerful tool for conducting in-depth studies on the properties of catalysts during reactions. Real-time information, such as shape transition, transient structures, localized electronic structure and chemical composition on the surface and bulk of catalysts, can be obtained during the reaction through a combination of advanced capabilities from in-situ TEM/XRD/XPS/UPS/STM. Combined with other useful advanced ex-situ methods, such as 3D tomography and catalyst simulation, catalyst design and synthesis can be effectively controlled with improved catalytic activity under the reaction conditions.



Atomic	Surface	Nanoscale	Bulk
In-situ STM	In-situ XPS and UPS	In-situ TEM	In-situ XRD
$10^{-10} - 10^{-8}$ torr LHe — 350K to 1400K	$10^{-10} - 10^{-4}$ torr LN ₂ — 1100 ° C	$10^{-8} - 10^{-6}$ torr RT — 900 ° C	$10^{-2} - 10^2$ torr RT — 1200 ° C

- spatial distribution of catalyst particles on support substrate
- metal support interaction effect
- growth dynamics/kinetics of supported model catalyst
- atomic surface structures (clusters, wires, vacancies & steps)



- shape and crystalline structure transition
- change in chemical composition and electronic structures
- interaction between reactants and catalysts
- reaction mechanisms/pathways



Our focus:

We aim to develop our integrated research capabilities to be relevant and useful for the investigation of heterogeneous catalysis work.

Our strength:

We conduct comprehensive investigations on heterogeneous catalysts ranging from atomic to bulk scale using advanced *in-situ* and *ex-situ* probes.

Our direction:

We work closely with local and overseas universities, research institutes as well as catalyst-related industry partners. We are always keen to collaborate with industry partners who are interested to tap on our resources.

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