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Size-Selected Cluster Based Catalysts: Physical and Chemical Properties Studied by GISAXS, .Mass Spectrometry and UV-VIS Spectroscopy STEFAN VAJDA, GREGORY BALLENTINE, ALEXANDRE BOUHELIER, Argonne National Laboratory, JOSEPH CALO, Brown University, JEFFREY ELAM, BYEONGDU LEE, CHIEH-TSUNG LO, CHRISTOPHER MARSHALL, STEPHANIE MUCHERIE, MICHAEL PELLIN, SOENKE SEIFERT, GARY WIEDERRECHT, RANDALL WINANS, Argonne National Laboratory —
Properties of highly stable cluster-based model nanocatalysts are studied. Examples on size-selected clusters Au_n (n=7-10), Ag_n (n=15-19), Pt_n (n=8-10) and 1-3 nm particles supported on thin oxide film coated flat and mesoporous supports address cluster stability under realistic reaction conditions, selective stabilization of particles and their reactivity. In situ GISAXS allows for correlation of catalyst performance with its size and shape of the catalyst. Pt-cluster based catalyst supported on mesoporous membranes were tested in a commercial tester in oxidative dehydrogenation of propane and exhibited excellent propane conversion and superb selectivity towards propene production at moderate temperatures, 400-550 ^{o}C with and without SnO promoter. Au and Ag catalysts were tested in ethylene and propylene oxidation, showing an onset of the reactivity between 160-200 ^{o}C.

Stefan Vajda
Argonne National Laboratory

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