

## Hydrogen uptake in nano-sized metallic and bimetallic clusters

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Abstract:

Size selective preparations of nano-meter-sized clusters in the range of 2-6 nm, such as Palladium clusters and bimetallic clusters (PdMg, PdNi and PdFe) will be presented. The preparation is performed by electrochemical method where a simple two electrodes cell is used; to prevent undesired agglomeration the clusters were stabilized in matrix such as: surfactant shell e.g. tetra-octyl-ammonium bromide which is used as electrolyte and stabiliser, or polymers matrix as Teflon AF and PMMA.

The interaction of hydrogen with these clusters from both kinetic and thermodynamic point of view was studied. Results on the hydrogen uptake, storage, behaviour in nano-sized metallic clusters; using volumetric measurements, gravimetric measurements will be presented. In situ X-ray synchrotrons measurements (XRD) and Extended X-Ray Fine Absorption Structure (EXAFS) measurements during hydrogen loading shows the formation of the Pd hydride phase for cubic clusters indicating an ( $\alpha$ - $\alpha'$ ) phase transition, while no ( $\alpha$ - $\alpha'$ ) phase transition was observed for icosahedral clusters.