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Preparation of Pure and Decorated Metal Oxide Materials for Energy Applications Using Novel Chemical and Physical Deposition Methods DANIELE PARADISO, ANDREW PEDERSEN, J. Z. LARESE, University of Tennessee — Metal oxides (MOs) nanomaterials represent a promising route to address our nation's energy challenges. We describe the synthesis, modification and characterization of MOs (e.g. MgO , ZnO and Al_2O_3). A novel vapor based method is used to produce the MgO and ZnO materials with narrow size distribution and selective microstructure. These MO nanoparticles can be produced in sizes ranging from a few to several hundred nanometers. In addition, various phases of alumina are produced from the same native Boehmite material, are calcined at various temperatures to prepare the γ-, θ- and α- Al_2O_3 (Corundum) phases. Each of the different MO materials exhibit attractive physicochemical properties that can be employed in areas such as gas separation, carbon capture/sequestration, as well as energy storage and conversion, and catalysis. Here the interest is focused on decorating the MOs supports with small metallic nanoclusters; this avenue of interest stems directly from the widespread use of MOs as supports for highly efficient catalysts. Description of our investigations using both chemical (CVD) and physical (PVD) metal vapor deposition methods using a magnetron based system to prepare and characterize these materials will be presented.

Daniele Paradiso
University of Tennessee

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