IDENTIFICATION OF SUPERSTRUCTURES IN TRANSITION METAL BI-METALLIC NANOCATALYSTS VIA NANOBEAM ELECTRON DIFFRACTION

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The precise control of nanostructures shapes, morphology and atomic arrangement is of utmost importance in the field of nanocatalysis whereby a careful design of structures of bimetallic nanoparticles can yield to a novel nanocatalyst for a multi-step chemical reaction. We report herein the precise control of the morphology of bimetallic gold-palladium (AuPd) nanocubes following a seed-mediated growth chemical synthesis method. The growth mechanism of the AuPd nanocubes has been investigated using Nanobeam Diffraction (NBD) in a Transmission Electron Microscope. By a careful examination of the NBD patterns, we confirmed the superlattice formation in the transition metal nanocubes by examining the L1_2 reflections located in the forbidden positions. A morphological analysis of the AuPd nanocubes has been made in our case using the aberration-corrected High Angle Annular Dark Field Scanning Transmission Electron Microscope (C_2-corrected HAADF-STEM). A discussion of thermodynamic and energetic factors is made in order to gain an insight into the formation of these ordered nanostructures and their paramount importance in determining key reaction sites, for potential applications in model and industrial nanocatalysis.