MS42-P03 | FORMATION MECHANISM OF EPITAXIAL PALLADIUM-PLATINUM CORE-SHELL NANOCATALYSTS IN A ONE-STEP SUPERCRITICAL SYNTHESIS

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Platinum-based nanomaterials are efficient catalysts for important processes such as NOx reduction, carbon monoxide oxidation, and hydrogen evolution. The catalytic properties makes the materials relevant in a large number of applications but the scarcity and high cost of platinum group metals provide an incentive for optimization of performance. In this study we demonstrate how core-shell Pd-Pt nanoparticles can be synthesized in a one-step hydrothermal method. Using in situ X-ray scattering analyzed through sequential fitting of the pair distribution function, it is found that primary particles are initially formed and that these agglomerate and crystallize into core-shell particles. Transmission electron microscopy (TEM) is utilized to show the elemental distribution, an epitaxial relationship between core and shell, and to confirm the results from X-ray scattering. Finally, the synthesis is performed on a flow reactor as a strategy for large-scale production. Here, small particles of pure Pt are observed in addition to the core-shell particles. The study points out the relevant parameters space for obtaining particles with desirable characteristics, and presents a strategy for large scale production with accurate parameter control.