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Title:	Facile d-band tailoring in Sub-10 nm Pd cubes by in-situ grafting on nitrogen-doped graphene for highly efficient organic transformations
Authors:	Sahoo, Lipipuspa (/jspui/browse?type=author&value=Sahoo%2C+Lipipuspa) Mondal, Sanjit (/jspui/browse?type=author&value=Mondal%2C+Sanjit) Nayana, C.B. (/jspui/browse?type=author&value=Nayana%2C+C.B.) Gautam, Ujjal K. (/jspui/browse?type=author&value=Gautam%2C+Ujjal+K.)
Keywords:	Coupling reactions In-situ synthesis
Issue Date:	2021
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Abstract:	We demonstrate for the first time the in-situ synthesis of Pd nanocubes (PdNC) on nitrogen-doped reduced graphene oxide (NRGO) for facile organic transformations wherein the cubic morphology of Pd can only be realized by precision-controlled acid additions in the tune of 0.02 pH variations in the reaction medium. Due to the intimate contact arising from atom-by-atom addition of Pd on NRGO, the composite has exhibited a pronounced catalyst to support charge transfer effect, shift in the d-band center, and lowering of charge-transfer resistance when compared with PdNC-NRGO ex-situ composites prepared by mixing of the preformed components of PdNC and NRGO or PdNCs alone. The activities of these catalysts were tested for the Suzuki coupling and nitroarene reduction reactions using water as an industry-friendly solvent. In both, the in-situ deposited sample exhibited substantially higher catalytic activity as well as stability when compared with an ex-situ sample or pure PdNCs. We show that a very high turnover frequency of ~31300 h ⁻¹ and ~900 h ⁻¹ are achievable by using the in-situ deposited PdNC-NRGO composite for Suzuki coupling reactions and nitroarene reduction respectively, better than the state-of-the-art catalysts developed recently, in addition to high recyclability.
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