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Title:	Self-immobilized Pd nanowires as an excellent platform for a continuous flow reactor: Efficiency, stability and regeneration
Authors:	Sahoo, Lipipuspa (/jspui/browse?type=author&value=Sahoo%2C+Lipipuspa) Mandal, S. (/jspui/browse?type=author&value=Mandal%2C+S.) Gautam, U.K. (/jspui/browse?type=author&value=Gautam%2C+U.K.) Mittal, Neeru (/jspui/browse?type=author&value=Mittal%2C+Neeru)
Keywords:	Nanocatalysts Catalyst regeneration Nanocrystals Spectroscopic studies Continuous flow reactors
Issue Date:	2018
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Abstract:	Despite extensive use of Pd nanocrystals as catalysts, the realization of a Pd-based continuous flow reactor remains a challenge. Difficulties arise due to ill-defined anchoring of the nanocrystals on a substrate and reactivity of the substrate under different reaction conditions. We demonstrate the first metal (Pd) nanowire-based catalytic flow reactor that can be used across different filtration platforms, wherein, reactants flow through a porous network of nanowires (10–1000 nm pore sizes) and the product can be collected as filtrate. Controlling the growth parameters and obtaining high aspect ratio of the nanowires (diameter = ~13 nm and length > 8000 nm) is necessary for successful fabrication of this flow reactor. The reactor performance is similar to a conventional reactor, but without requiring energy-expensive mechanical stirring. Synchrotron-based EXAFS studies were used to examine the catalyst microstructure and Operando FT-IR spectroscopic studies were used to devise a regenerative strategy. We show that after prolonged use, the catalyst performance can be regenerated up to 99% by a simple wash-off process without disturbing the catalyst bed. Thus, collection, regeneration and redispersion processes of the catalyst in conventional industrial reactors can be avoided. Another important advantage is avoiding specific catalyst-anchoring substrates, which are not only expensive, but also non-universal in nature.
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