Development of nanoscale carbon for active and durable electrocatalysts

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Developing active and durable electrocatalysts is of significance for various energy conversion devices, such as fuel cell. The conventional catalysts constituted Pt nanoparticles (NPs) supported on carbons suffer from their insufficient durability during the reaction. Physical and chemical stability and anticorrosion properties are highly demanding criteria for durable catalysts. Nowadays physicochemical tenability of carbon materials via doping, functionalization and morphology engineering opens its functional role in electrocatalytic applications. In this talk, we show a strategy to prepare carbon-shell-protected NPs that have both high catalytic activity and long-term stability for electrochemical energy applications. A single-step thermal treatment of polydopamine-coated NPs leads to the formation of thin-layer carbon shell, providing physical and chemical protections preventing NP degradation during electrochemical operation condition. Finally, we also present several promising strategies to enhance utilization of porous structure in carbonaceous materials for electrocatalysis, focusing on bridging functional links between electrochemical performance and its pore structure.