Nanoelectrocatalysts for Energy and Water Treatment

Bio-inspired metal-metal oxides as Pd support catalysts for CO2 electro-reduction into electrofuels

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Abstract
The chapter provides significant and insightful methodological developments and strategies in the field of applied nanotechnology in particular applications in catalysis, pollution and energy. Owing to detrimental climate change and depletion of fossil fuels, we explore novel nanomaterial i.e., ‘smart’ metal-metal oxides and palladium-based electrocatalysts to achieve the requirements of sustainable and renewable resources. In the last decade, researchers have been engaged in the development of new and fundamental chemistries that will transform the field of nanotechnology and humans. In this view, the concept of green chemistry was coined in the early 1990s and was regarded as the engine in the development of new green nanomaterial. This transition is driving the investigation of green chemistry to mitigate environmental problems, replace traditional methods with novel designs and ultimately replace unsustainable chemistries. With this consideration, the preparation of catalytically active bio-inspired Ni/MgO and Cu/Cu2O/CuO/ZnO and Pd-based Pd-NiO/C, Pd/C and Pd-Cu/Cu2O/CuO/Zn using plant biological entities and waste materials as an eco-friendly, green route are explored. This chapter highlights the mechanism of interaction whilst exploring in-depth the leading edge of green-prepared nanomaterials in storage and energy conversion. This comprises studying the electrochemical phenomena of nanostructured materials, electrocatalysis, activity, stability, vital processes of polarisation resistance and diffusion-controlled systems at the nanostructured electrode surface through catalysis. A short overview and use of nanostructured material in energy spheres such as carbon dioxide electrochemical systems to produce energy fuels are also covered.