Synthesis and characterization of $Cu/Al_2O_3/ZnO$ nanowires as methanol steam reforming catalysts

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One dimensional hetero-nanostructures have attracted great interest as versatile multifunctional building blocks due to their potential applications in electronics and photonic devices, solar cells and novel catalysts. Recently, many studies related to the core-shell nanowires have been mainly focused on demonstration of their feasibility for potential applications through the systematic and robust synthetic routes of these hetero-nanostructures. In this work, we present novel $Cu/Al_2O_3/ZnO$ nanowires for film type catalysts for methanol steam reforming(MSR) toward the power supply of portable devices, leading to overcome the conventional Cu/ZnO catalysts with coprecipitation methods. To form $Cu/Al_2O_3/ZnO$ nanowire catalysts, long ZnO nanowires were synthesized via the conventional solution methods, and then Cu and Al_2O_3 nanoparticles on the surface of ZnO nanowire were created by electroless deposition and atomic layer deposition. Finally, as-synthesized catalysts performance with long-time stability is discussed systematically according to the changes of geometrical shape and morphology for $Cu-Al_2O_3$ nanoparticles on the surface of ZnO NWs.