Designing of Pt-CeO_2@SiO_2 core-sheath nanofibers using electrospinning and wet impregnation for CO_2 Hydrogenation

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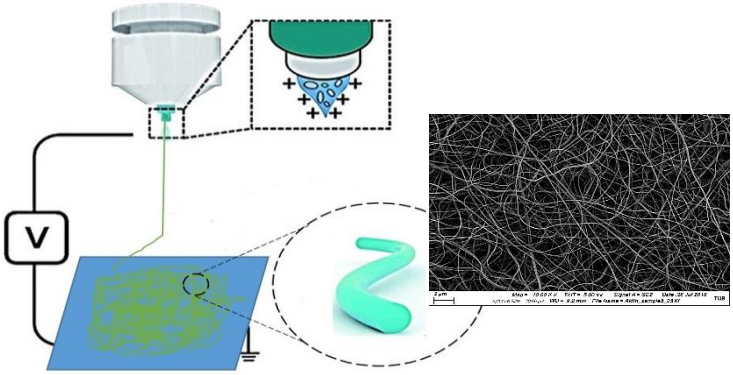

Bifunctional (tandem) catalysts are among the most widely used types of catalysts provide a catalytic vessel for completing two or more reactions in one-step. Since these types of catalysts are generally prepared by physical mixing or co-precipitation, it might leave composition and surface inconsistency that reduce the selectivity and catalyst performance [1]. Therefore, to overcome this drawback, it is highly desirable to assemble a well-integrated tandem catalyst structure such as core-shell which arrange all considered materials (metal oxides/zeolite) in one framework and enhance the synergistic effects [2]. However, regardless of possessing core-shell or conventional structure, metal particles or nanoparticles are suffering sintering and aggregation during the catalytic process especially in harsh environments which cause to loss of catalytic performance by missing surface area and active sites [3, 4]. Moreover, previous studies showed that morphology highly can affect the specific surface area and catalytic performance. Nanofiber (NF) is one of the promising 1D structures which attracted interest in providing higher specific surface area due to its high surface-to-volume ratio. One of the facile method to produce NFs is Electrospinning (ES) which is a straightforward cost-effective technique to create fibers in dimension of nanometer to several micrometers with various so that a unique property can be obtained [5].

In this research, a core-sheath structure of Pt-CeO_2@SiO_2 nanofibers were fabricated using electrospinning technique. A characterization study was performed including X-ray diffraction (XRD), surface area analysis by nitrogen adsorption measurement through Brunauer, Emmett and Teller (BET), Scanning electron microscopy (SEM). Also, in order to evaluate Pt distribution and core-sheath structure, High resolution transmission electron microscopy (HRTEM) was done. We expect that by possessing nanofibers, the drawbacks such as losing surface area, active sites can be minimized and catalytic performance might be increased.

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