2E03 **Pd(II)-doped SiO_2/Fe_2O_3 nanofibers as an available catalyst toward ethanol dehydration reaction**

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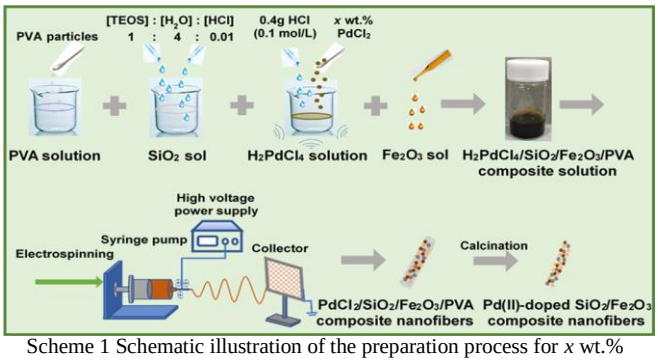
1. Introduction

Ethylene (C_2H_4), one of the world's most attractive and consumptive chemicals, is produced mainly by thermal cracking of petroleum in industry since decades. When coming up against the growth of population and industrial demand, the diminishing availability of raw fossil resources leads to an unbalanced global development and rising prices. Moreover, the resulting serious energy crisis and various environmental issues have posed a looming threat to the present-day society. Thus, these disturbing problems have encouraged researchers to take into account a progressive changeover to renewable resources and develop a promising substitute.

2. Experimental

The detailed preparation process of Pd(II)-doped SiO_2/Fe_2O_3 nanofibers (NFs) has been illustrated in Scheme 1. Some characterization methods regarding XRD, SEM, FE-SEM, EDX, XPS and BET were carried out to explore their structures and properties. Furthermore, the catalytic reaction of ethanol dehydration conducted by these synthesized samples was evaluated.



Scheme 1 Schematic illustration of the preparation process for *x* wt.% Pd(II)-doped SiO_2/Fe_2O_3.

3. Results and discussion

A uniform smooth surface of continuous fibers oriented randomly can be obviously observed with a diameter of about 206.58 nm (Fig. 1(a and b). The FESEM image of 0.05 wt.% Pd(II)-doped SiO_2/Fe_2O_3 NFs in Fig. 1c also exhibits a good morphology, accompanied with an EDX element mapping test (Fig. 1(d-f)) and EDX spectrum (Fig. 1g). It confirms the presence of element O, Fe, Si except for Pd, which is attributed to the low dosage of Pd that cannot be tested by EDX. Additionally, the 0.1 wt.% Pd(II)-doped SiO_2/Fe_2O_3 NFs are further measured by FESEM (Fig. 1h), EDX spectrum (Fig. 1i) and corresponding element mapping for O, Fe, Si, Pd, respectively (Fig. 1(j-m)). The results confirm that the O, Fe, Si and Pd exist with uniform distribution throughout the fiber direction, whereas along with an impurity peak of carbon originated from the attached conductive colloidal graphite.

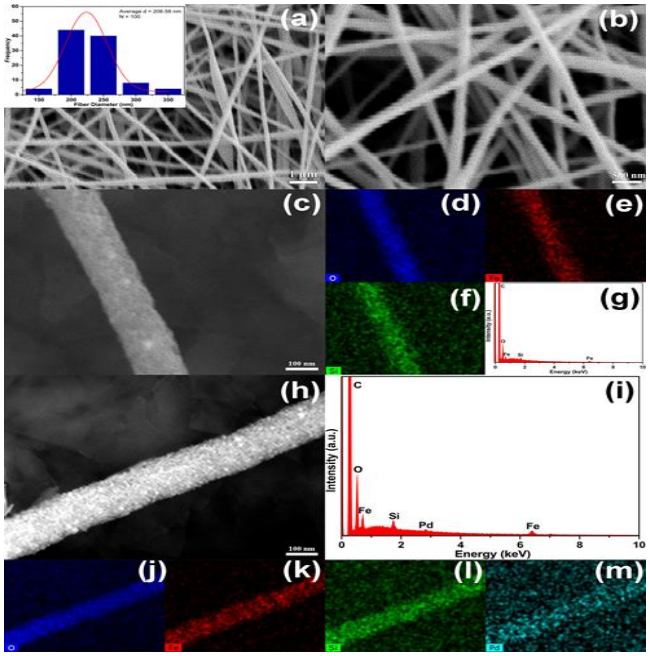


Fig. 1 SEM images of 0.1 wt.% Pd(II)-doped SiO_2/Fe_2O_3 NFs under different magnifications (a, b) with fiber diameter distribution (inset of a); FESEM images (c), corresponding elemental mapping patterns (d-f) and EDX spectrum (g) of 0.05 wt.% Pd(II)-doped SiO_2/Fe_2O_3 NFs; FESEM images (h), EDX spectrum (i) and corresponding elemental mapping pattern (j-m) of 0 1 wt.% Pd(II)-doped SiO_2/Fe_2O_3 NFs.

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