Electronic Supplementary Material (ESI) for RSC Advances.


# Supplementary Information

## Pd cocatalyst on Sm-doped $BiFeO_3$ nanoparticles: Synergetic effect of Pd cocatalyst and samarium doping on photocatalysis

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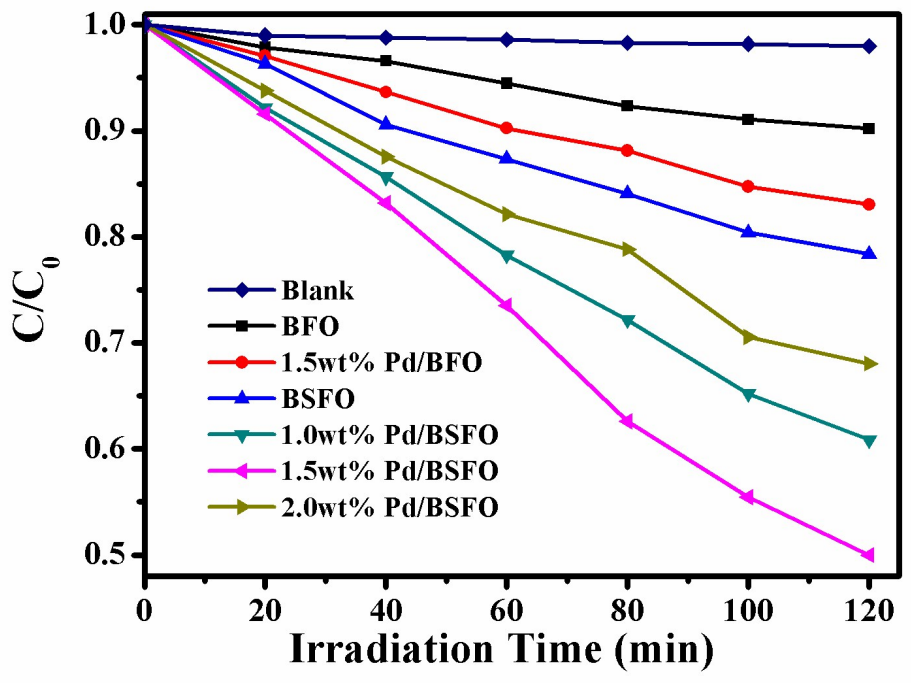


**Fig. S1**. Photocatalytic degradation of phenol as a function of the irradiation time under visible light ($\lambda \geq 420$ nm) irradiation for different photocatalyst samples.

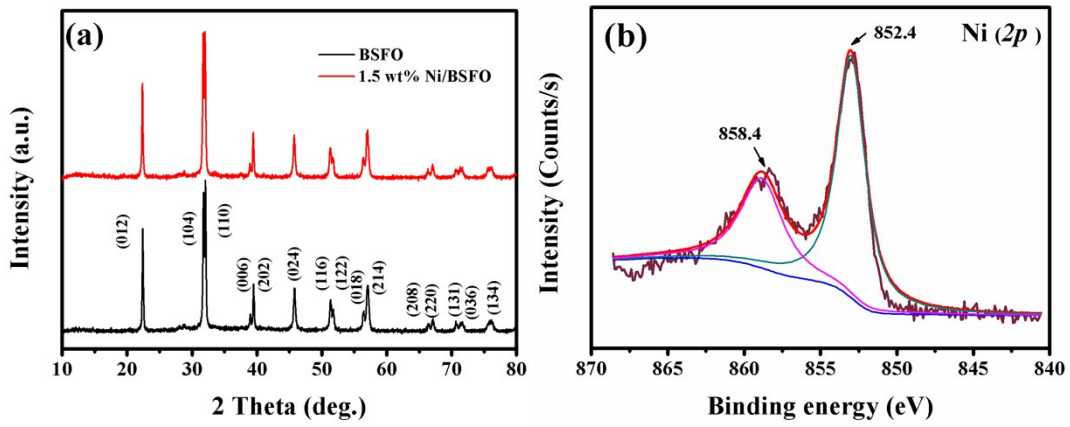


**Fig. S2**. (a) XRD patterns of the synthesized BSFO and 1.5 wt% Ni/BSFO samples; (b) XPS spectra of Ni element for the 1.5 wt% Ni/BSFO sample.

Fig. S2(a) shows the XRD patterns of the prepared BSFO and 1.5 wt% Ni/BSFO samples. It can be seen that the diffraction peaks of the prepared 1.5 wt% Ni/BSFO sample matched well with the rhombohedral perovskite structure with the space group of R3c (JCPDF No.86-1518), which was in good agreement with those of the prepared BSFO. Meanwhile, no diffraction peaks of Ni were observed in the prepared 1.5 wt% Ni/BSFO sample, due to the relatively low concentration of Ni [1]. In order to clarify the chemical state of Ni element in the 1.5 wt% Ni/BSFO sample, the X-ray photoelectron spectroscopy (XPS) was applied. The XPS core level spectrum of Ni *2p* is shown in Fig. S2(b). The binding energies located at 852.4 and 859.4 eV could be identified as the $2p_{3/2}$ of metallic Ni [2], confirming the presence of metallic Ni in the as-prepared 1.5 wt% Ni/BSFO sample.

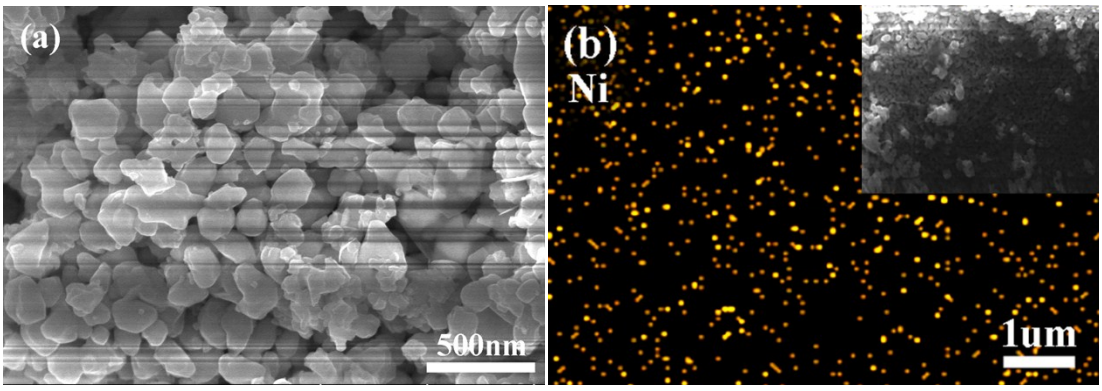


**Fig. S3**. (a) SEM micrograph of the 1.5 wt% Ni/BSFO sample; (b) EDX distribution map of Ni element (Inset: the corresponding SEM micrograph of the 1.5 wt% Ni/BSFO sample).

Fig. S3(a) shows the typical SEM image of the obtained 1.5 wt% Ni/BSFO sample. As shown, the sample was composed of irregular nanoparticles with a grain size of 100 ~ 150 nm. As presented in Fig. S3(b), the dispersion state of yellow dots representing Ni element were well-proportioned, indicating a well dispersion of Ni on the surface of BSFO.

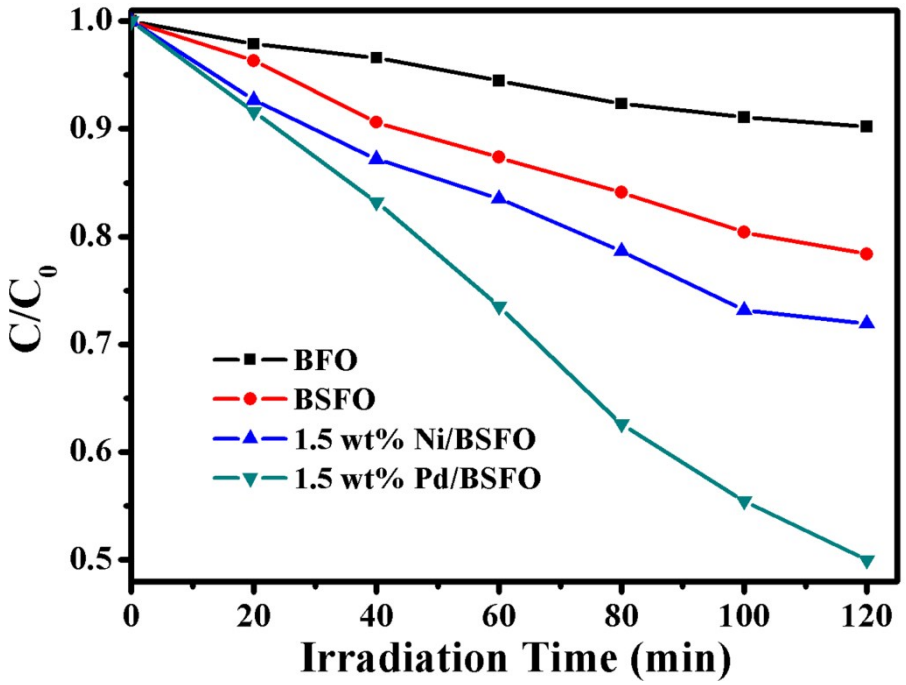


**Fig. S4** Photocatalytic degradation of phenol with 1.5 wt% Ni/BFO and 1.5 wt% Ni/BSFO samples in 2 h under visible light irradiation.

## *Reference*

[1] S. Onsuratoom, T. Puangpetch, S. Chavadej, Comparative investigation of hydrogen production over Ag-, Ni-, and Cu-loaded mesoporous-assembled $TiO_2$–$ZrO_2$ mixed oxide nanocrystal photocatalysts, Chem. Eng. J. 173 (2011) 667–675.

[2] H. C. He, P. Xiao, M. Zhou, Y. H. Zhang, Q. Lou, X. Z. Dong, Boosting catalytic activity with a pen junction: Ni/$TiO_2$ nanotube arrays composite catalyst for methanol oxidation, Int. J. Hydrogen Energ. 37 (2012) 4967-4973.