Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

A novel ethanol gas sensor based on α-$Bi_2Mo_3O_{12}$/Co_3O_4 nanotube-decorated particles

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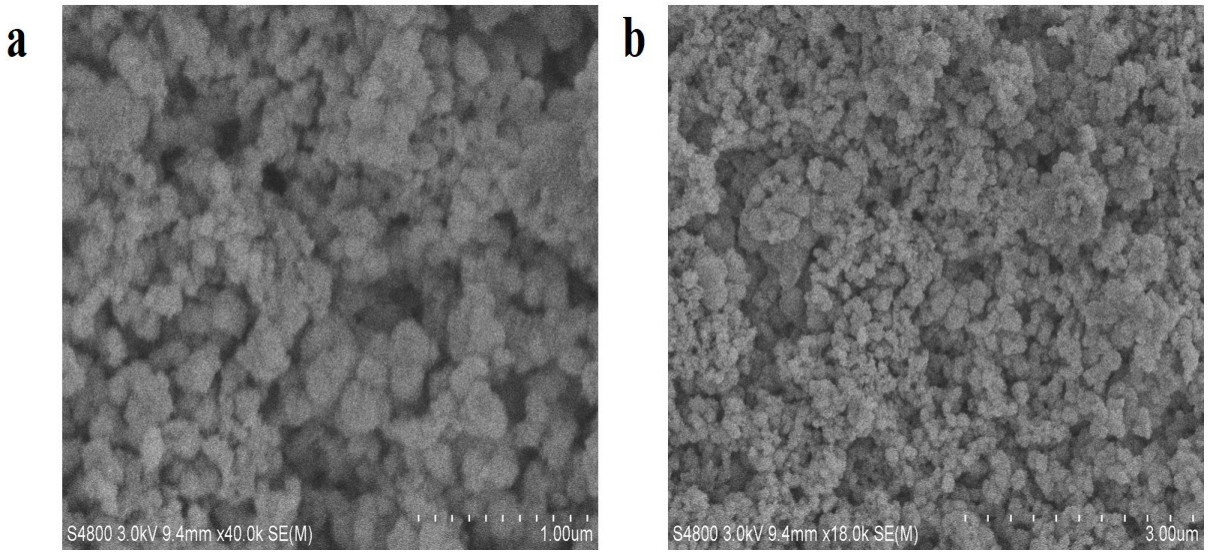

Figure. S1(a, b). Schematic diagram shows SEM high and low magnification the Co_3O_4 nanoparticles.

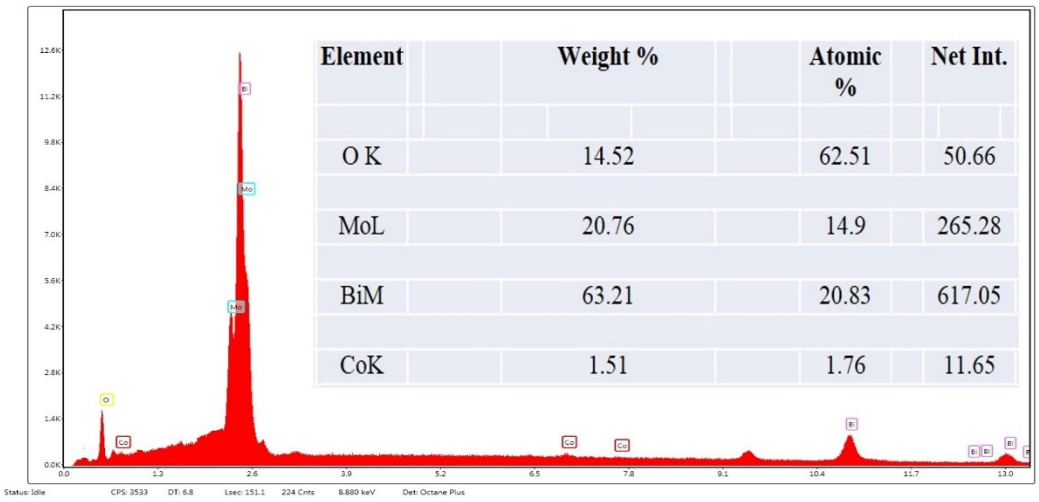

Figure S2. Schematic diagram shows the EDS spectrum of composite based on α-$Bi_2Mo_3O_{12}$/Co_3O_4 nanotube-decorated with Co_3O_4 nanoparticles.

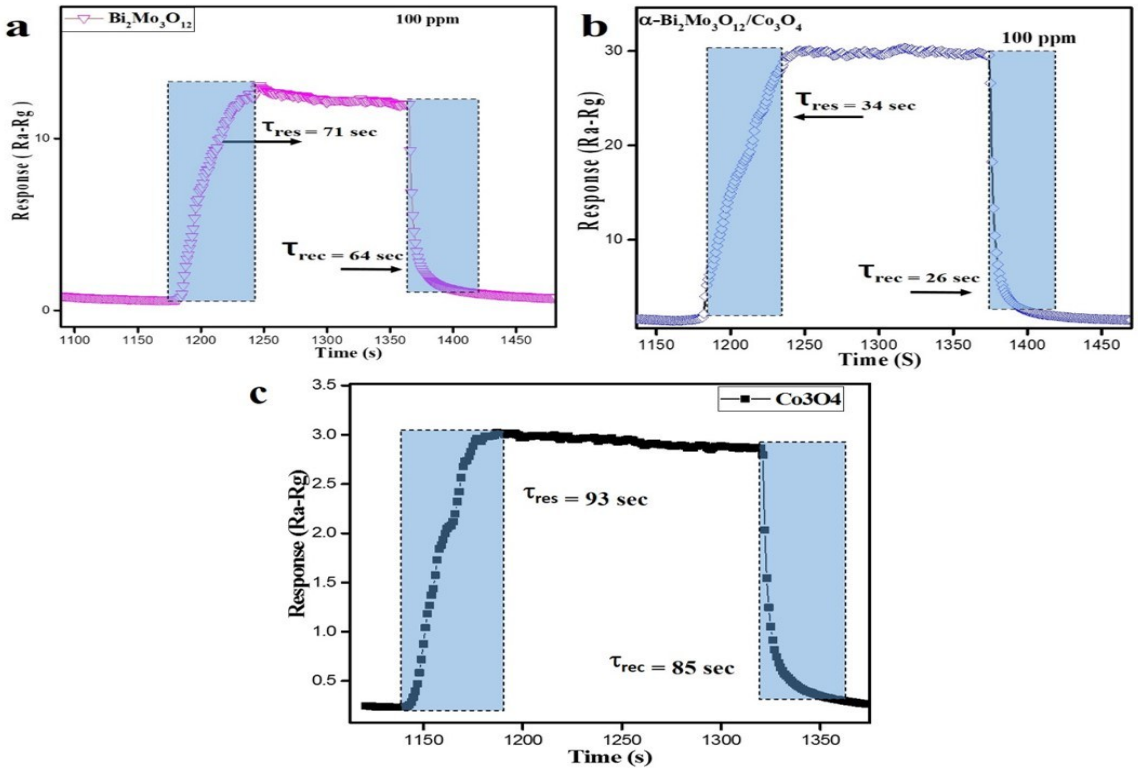

Figure S3(a-c). (a) Schematic diagram shows response and recovery features of pure α-$Bi_2Mo_3O_{12}$ nanofibers(b) The Response/Recovery feature of composite based on α-$Bi_2Mo_3O_{12}$/Co_3O_4 nanotube-decorated particles while (c)show Response/Recovery feature of Co_3O_4 nanoparticles.

Hall Experiment:

We carried out Hall measurement experiment with model Nanometric, HL5500 of our powder samples based on pure Co_3O_4 nanoparticles and α-$Bi_2Mo_3O_{12}$ nanofibers, which somewhat exposed p-type behavior of Co_3O_4 and n-type behavior of α-$Bi_2Mo_3O_{12}$. Our response about this comment that introduced into the revised manuscript as follow:

"The electrical resistivity, carrier concentration, and mobility for powder sample based on pure Co_3O_4 nanoparticles and α-$Bi_2Mo_3O_{12}$ nanofibers were obtained by the four-probe van der Pauw method using Hall-effect measurement system with model Nanometric, HL5500 in a magnetic field strength of 0.508 T, as exposed in **Table S1**. Based on these measurements, it can be seen that the Co_3O_4 nanoparticles sample exhibit *p*-type conduction due to positive Hall coefficient of 1.42 $x10^{06}$ m^2/C having low resistivity of 2.976 $x10^7$ Ω-cm, charge mobility of 47.8 cm^2 /V-s and high carrier concentration of 4.388 $x10^9$ cm^{-3} were achieved. While, α-$Bi_2Mo_3O_{12}$ nanofibers sample exhibit *n*-type conduction due to negative Hall coefficient of -7.86 $x10^{06}$ m^2/C with having high resistivity of 7.488 $x10^7$ Ω-cm, charge mobility of 105 cm^2 /V-s and negative carrier concentration of -7.943 $x10^8$ cm^{-3} were acquired.

Table S1: Hall effect measurement results for powder sample based on pure Co_3O_4 nanoparticles and α-$Bi_2Mo_3O_{12}$ nanofibers at ambient temperature.

Sample Code.	**Resistivity R (ohm-cm)**	**Hall coefficient RHs (m^2/C)**	**Carrier density N (/cm^3)**	**Mobility (cm^2/V-s)**
Co_3O_4 nanoparticles	2.976 x10^7	+1.42 x10^{06}	+4.388 x10^9	47.8
α-$Bi_2Mo_3O_{12}$ nanofibers	7.488 x10^7	-7.86 x10^{06}	-7.943 x10^8	105

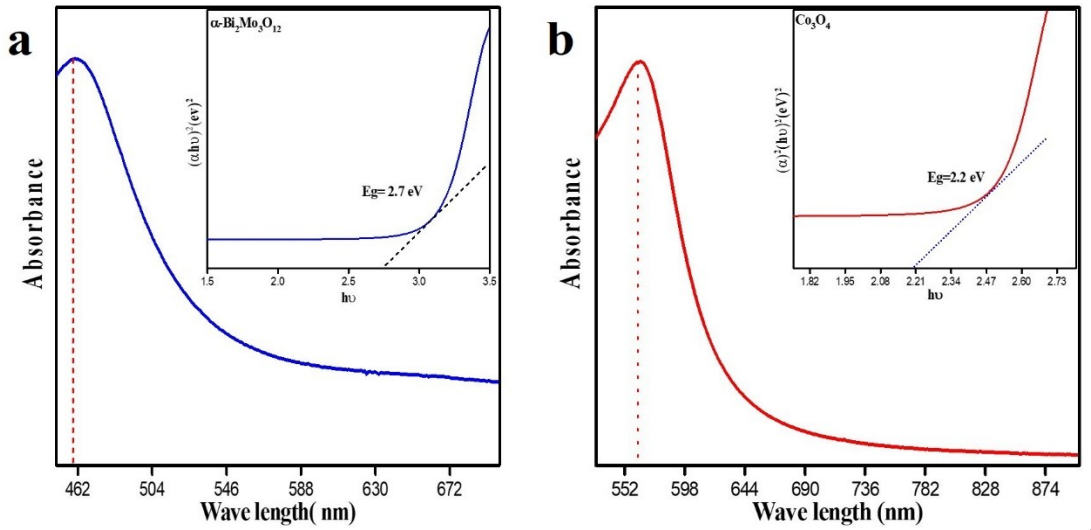

Figure S4(a, b). Photograph show UV-vis spectrum while insight figure shows bandgap energy of pure α-$Bi_2Mo_3O_{12}$ nanofibers (b) Composite based on α-$Bi_2Mo_3O_{12}$/Co_3O_4 nanotube-decorated particles.