SUPPORTING INFORMATION

Ag-SPR and Semiconductor Interface Effect on Ternary CuO@Ag@Bi_2S_3 Z-Scheme Catalyst for Enhanced Removal of HIV Drugs and (Photo)Catalytic Activity

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List of Supplementary Figures

Scheme S1. Schematic representation of CuO@Ag@Bi_2S_3 ternary composite prepared by uttrasonication method

Figure S1. XPS spectra of the synthesized CuO@Ag@Bi_2S_3 ternary composite: (a) Cu 2p, (b) Bi 4f, (c) Ag 3d, (d) C1s, (e) S 2p, and (f) O 1s.

Figure S2. UV-vis diffuse reflectance spectra (a) and photoluminescence spectra (b) of the synthesized CuO, Bi_2S_3, Ag@CuO, Ag@Bi_2S_3, CuO@Bi_2S_3, and CuO@Ag@Bi_2S_3 ternary composite.

Figure S3. The UV-vis absorption profiles of the removal efficiencies of (a) STV and (b) ZDV HIV drugs using CuO@Ag@Bi_2S_3 ternary composite

Figure S4. The degradation efficiencies of (a) MB, (b) RhB, (c) MB at 664 nm in MB + RhB, and (d) RhB at 553 nm in MB + RhB mixed dye using CuO, Bi_2S_3, Ag@CuO, Ag@Bi_2S_3, CuO@Bi_2S_3, and CuO@Ag@Bi_2S_3 ternary composite under visible light irradiation.

Figure S5. The kinetics of (a) MB, (b) RhB, (c) MB at 664 nm in MB + RhB, (d) RhB at 553 nm in MB + RhB mixed dye, and (e) MCP degradation using CuO, Bi_2S_3, Ag@CuO, Ag@Bi_2S_3, CuO@Bi_2S_3, and CuO@Ag@Bi_2S_3 ternary composite under visible light irradiation.

Figure S6. Reuse experiments of the synthesized CuO@Ag@Bi_2S_3 ternary composite in the photocatalytic degradation of (a) MB and (b) RhB dyes under visible light irradiation.

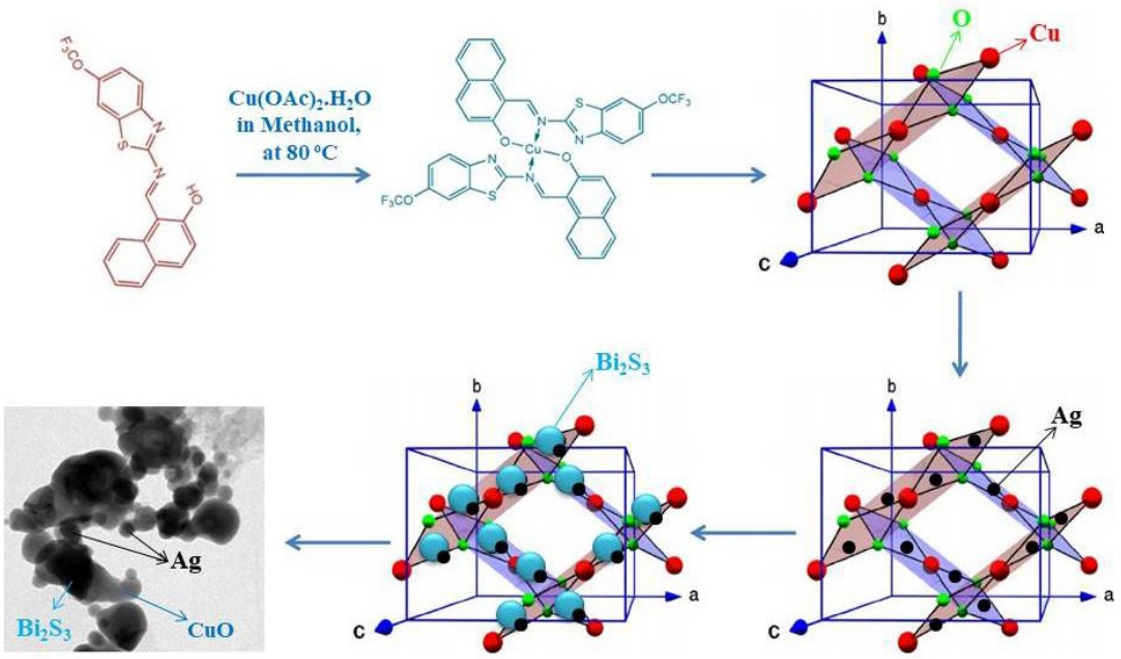
Figure S7. Trapping experiments of active species during the photocatalytic degradation of (a) MB, (b) RhB, (c) MB at 664 nm in MB + RhB, and (d) RhB at 553 nm in MB + RhB mixed dye using CuO@Ag@Bi_2S_3 ternary composite under visible light irradiation.

Figure S8. Trapping experiment of active species during degradation of MCP over CuO@Ag@Bi_2S_3 ternary composite catalyst under visible light irradiation.

Figure S9. The kinetics of 4-NP reduction using CuO, Bi_2S_3, Ag@CuO, Ag@Bi_2S_3, CuO@Bi_2S_3, and CuO@Ag@Bi_2S_3 ternary composite.

Scheme S2. Speculated reaction mechanism of the photocatalytic degradation of organic pollutants (dyes, pesticides, and antibiotics) catalyzed by CuO@Ag@Bi_2S_3 ternary composite.

Supplementary Figures



Scheme S1

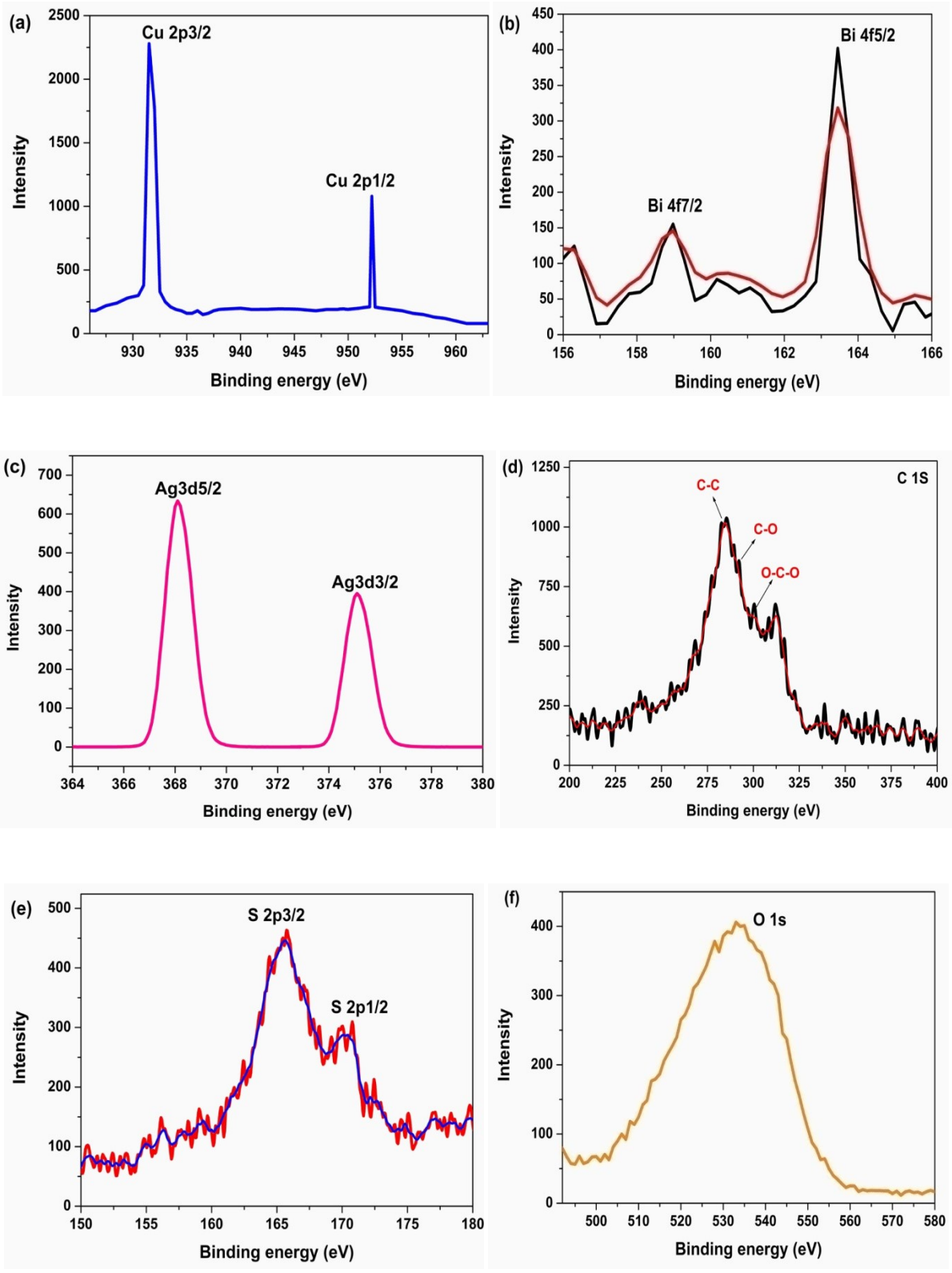
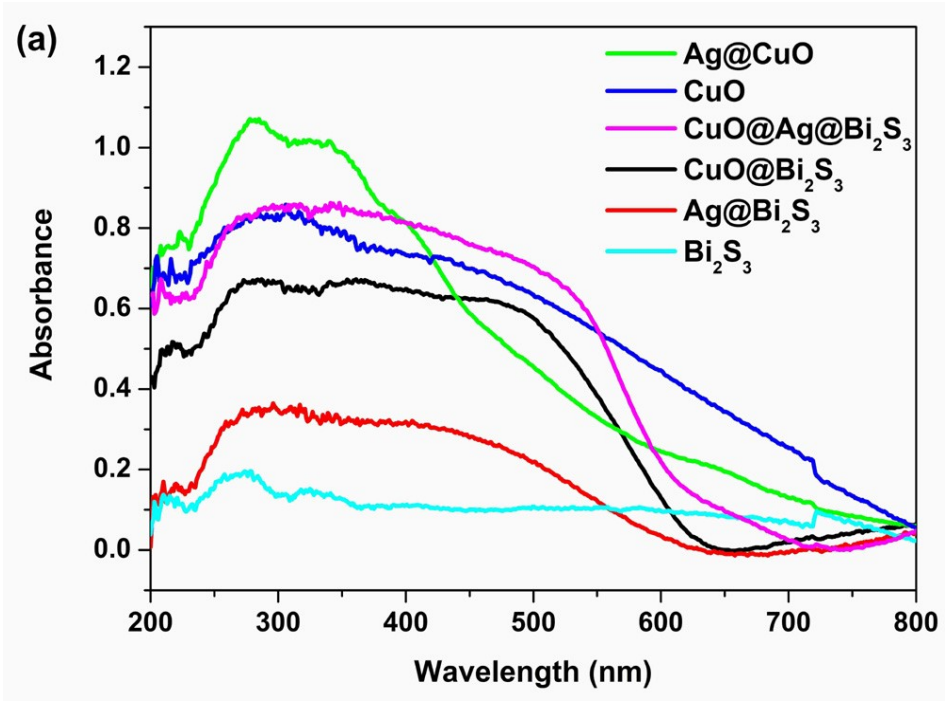

(a)
Cu 2p3/2
Cu 2p1/2
Intensity
Binding energy (eV)
(b)
Bi 4f5/2
Bi 4f7/2
Intensity
Binding energy (eV)
(c)
Ag3d5/2
Ag3d3/2
Intensity
Binding energy (eV)
(d)
C 1S
C-C
C-O
O-C-O
Intensity
Binding energy (eV)
(e)
S 2p3/2
S 2p1/2
Intensity
Binding energy (eV)
(f)
O 1s
Intensity
Binding energy (eV)

Figure S1


(a)
Absorbance
Wavelength (nm)
Ag@CuO
CuO
CuO@Ag@Bi2S3
CuO@Bi2S3
Ag@Bi2S3
Bi2S3

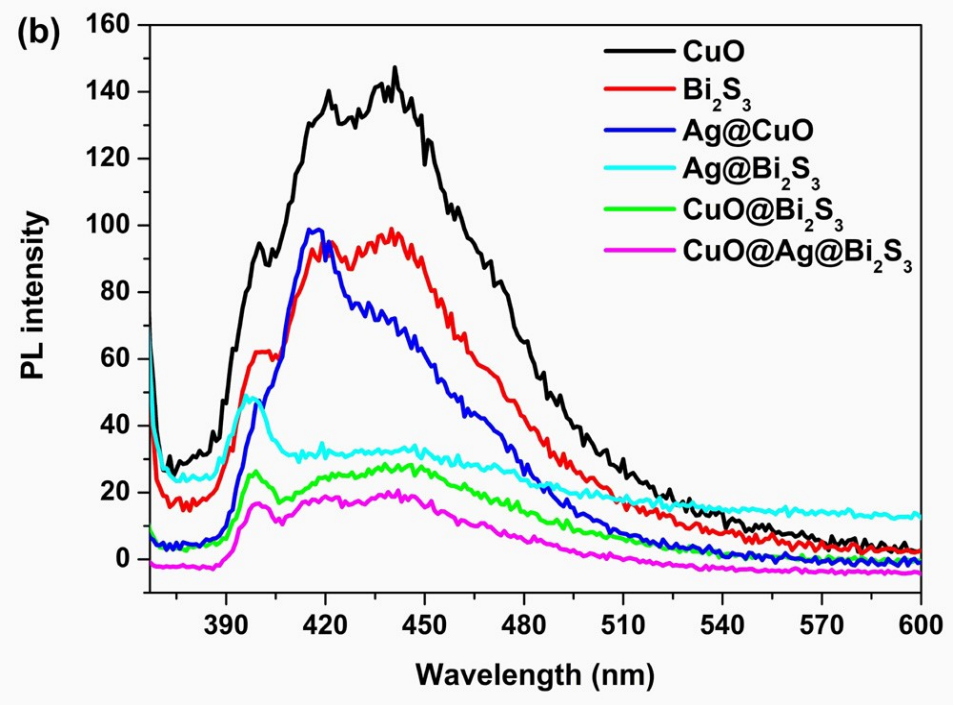

(b)
PL intensity
Wavelength (nm)
CuO
Bi2S3
Ag@CuO
Ag@Bi2S3
CuO@Bi2S3
CuO@Ag@Bi2S3

Figure S2

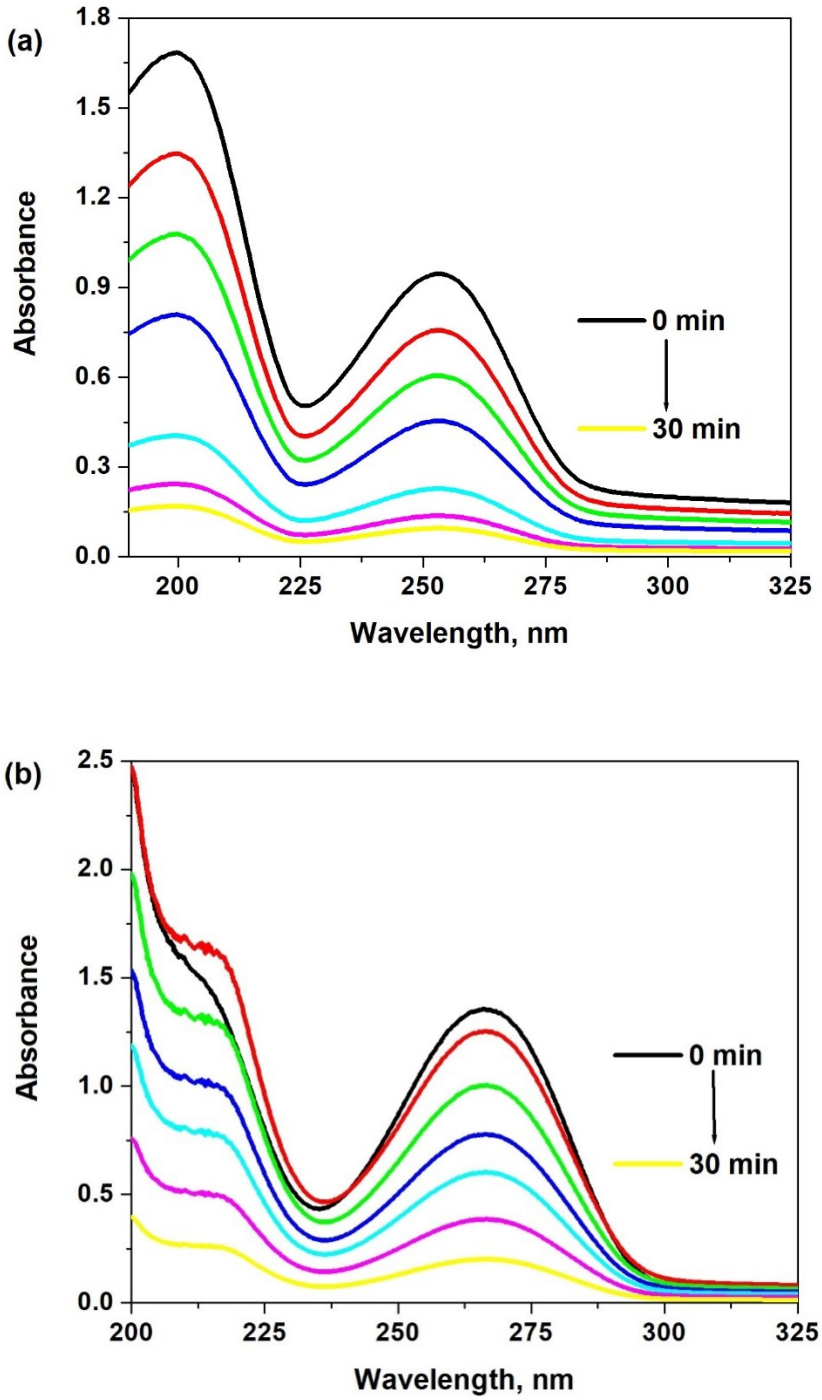

(a)
Absorbance
1.8
1.5
1.2
0.9
0.6
0.3
0.0
200
225
250
275
300
325
Wavelength, nm
0 min
30 min
(b)
Absorbance
2.5
2.0
1.5
1.0
0.5
0.0
200
225
250
275
300
325
Wavelength, nm
0 min
30 min

Figure S3

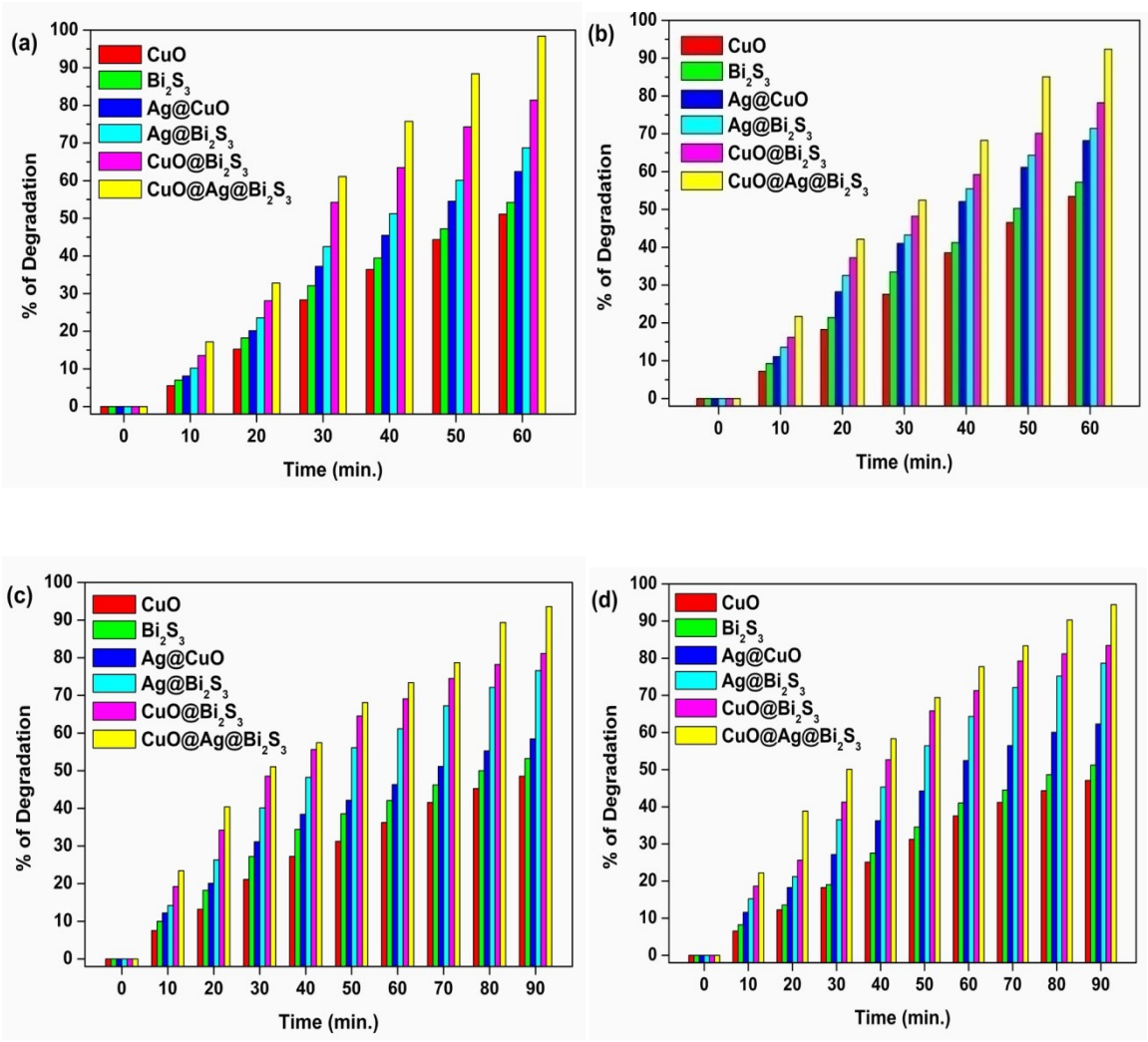

(a)
(b)
(c)
(d)
% of Degradation
Time (min.)
CuO
Bi2S3
Ag@CuO
Ag@Bi2S3
CuO@Bi2S3
CuO@Ag@Bi2S3

Figure S4

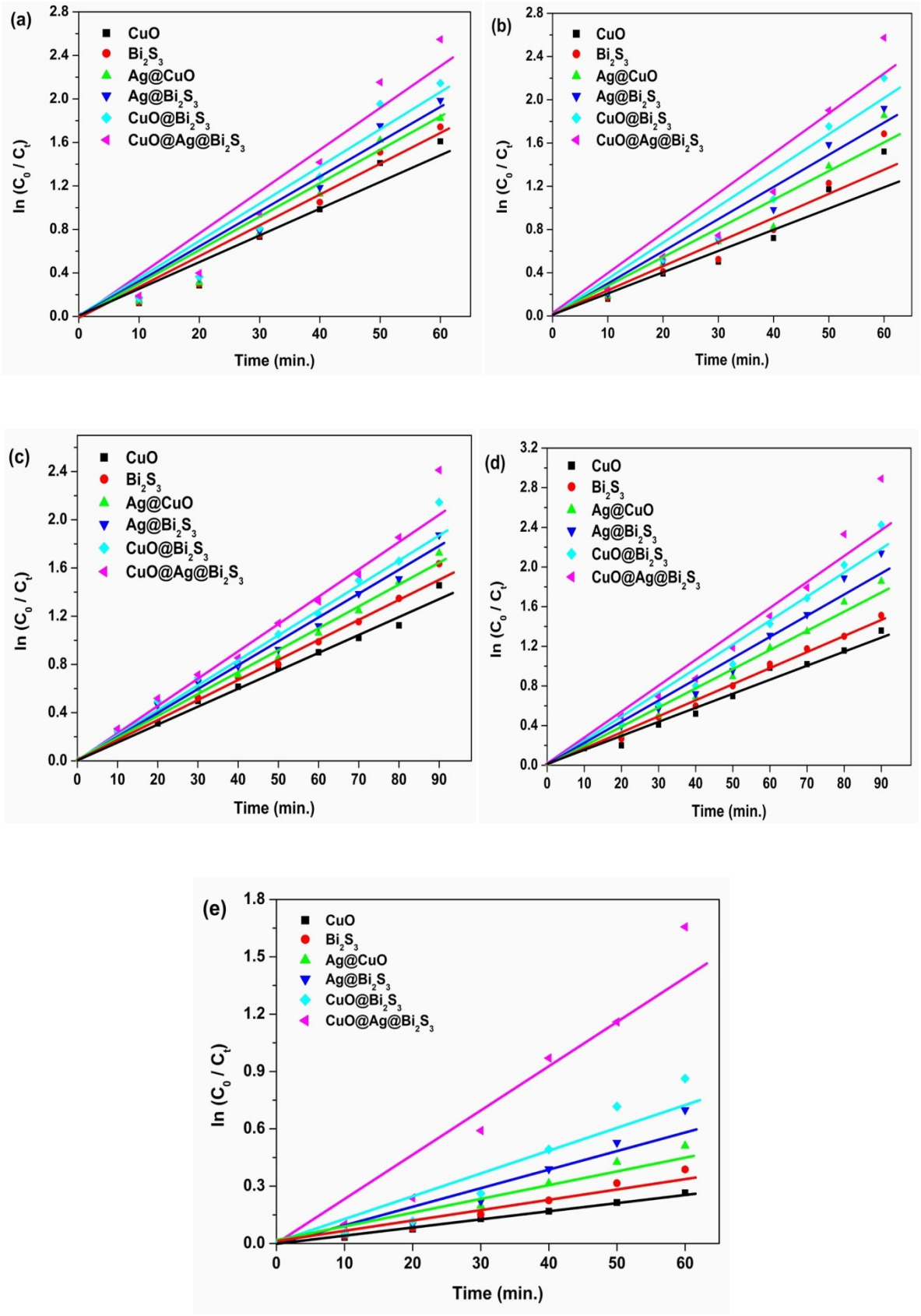
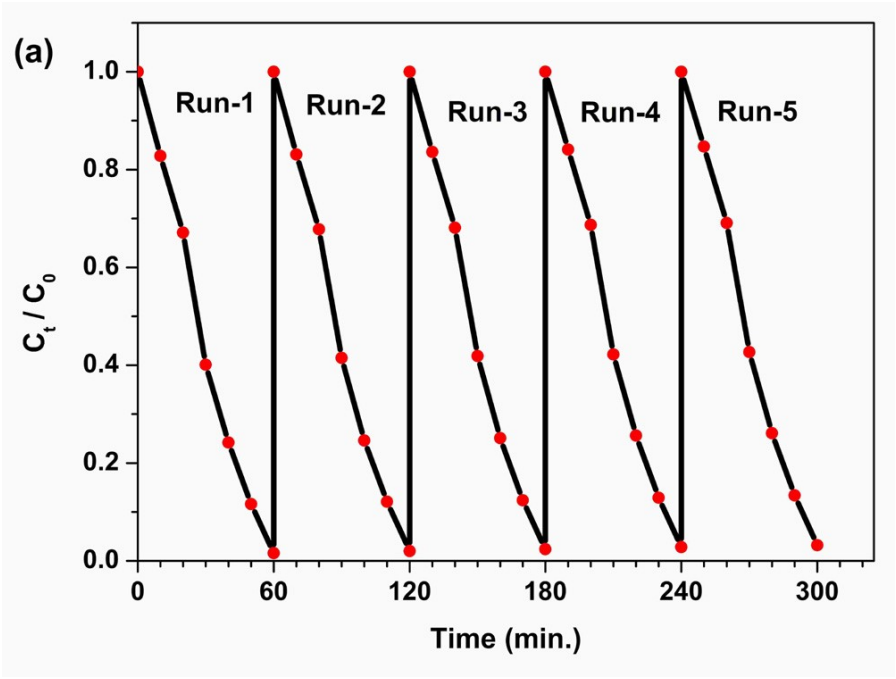

(a)
(b)
(c)
(d)
(e)
CuO
Bi2S3
Ag@CuO
Ag@Bi2S3
CuO@Bi2S3
CuO@Ag@Bi2S3
ln (C0 / Ct)
Time (min.)

Figure S5


(a)
Run-1
Run-2
Run-3
Run-4
Run-5
C_t / C_0
1.0
0.8
0.6
0.4
0.2
0.0
0
60
120
180
240
300
Time (min.)

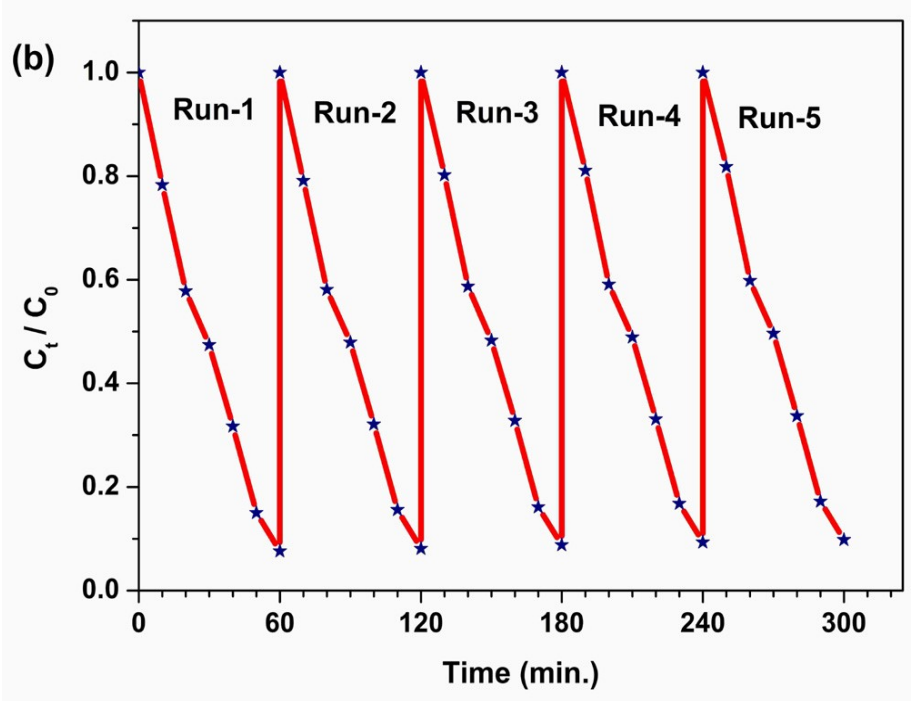

(b)
Run-1
Run-2
Run-3
Run-4
Run-5
C_t / C_0
1.0
0.8
0.6
0.4
0.2
0.0
0
60
120
180
240
300
Time (min.)

Figure S6

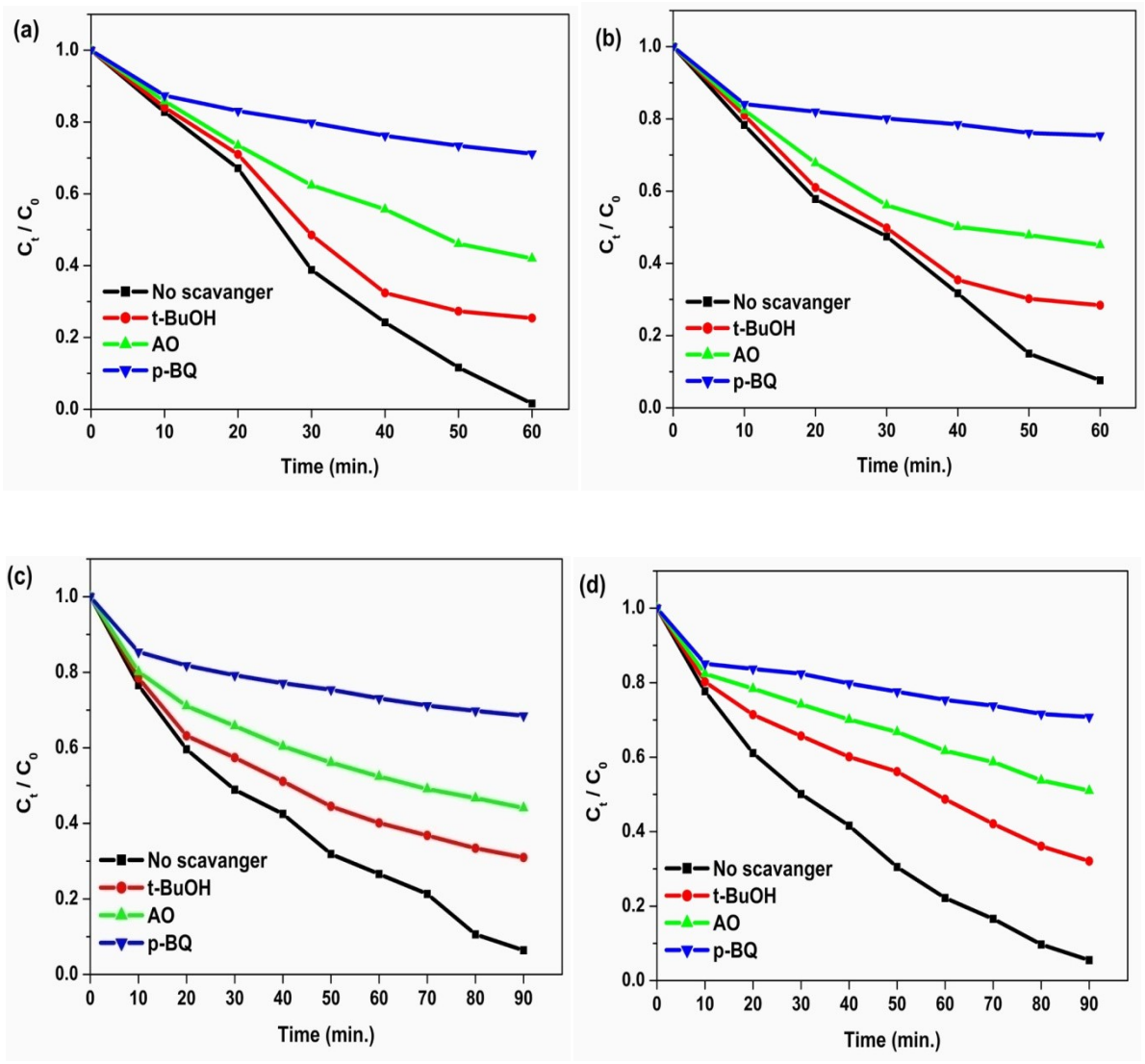


Figure S7

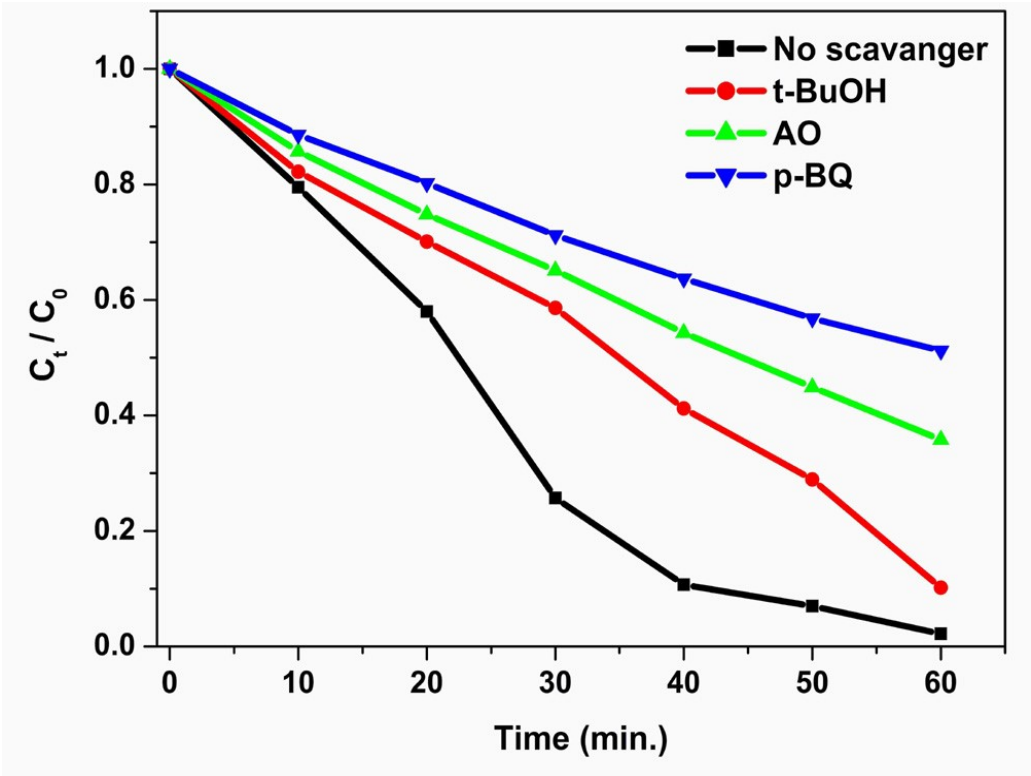

No scavanger
t-BuOH
AO
p-BQ
C_t / C_0
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
Time (min.)

Figure S8

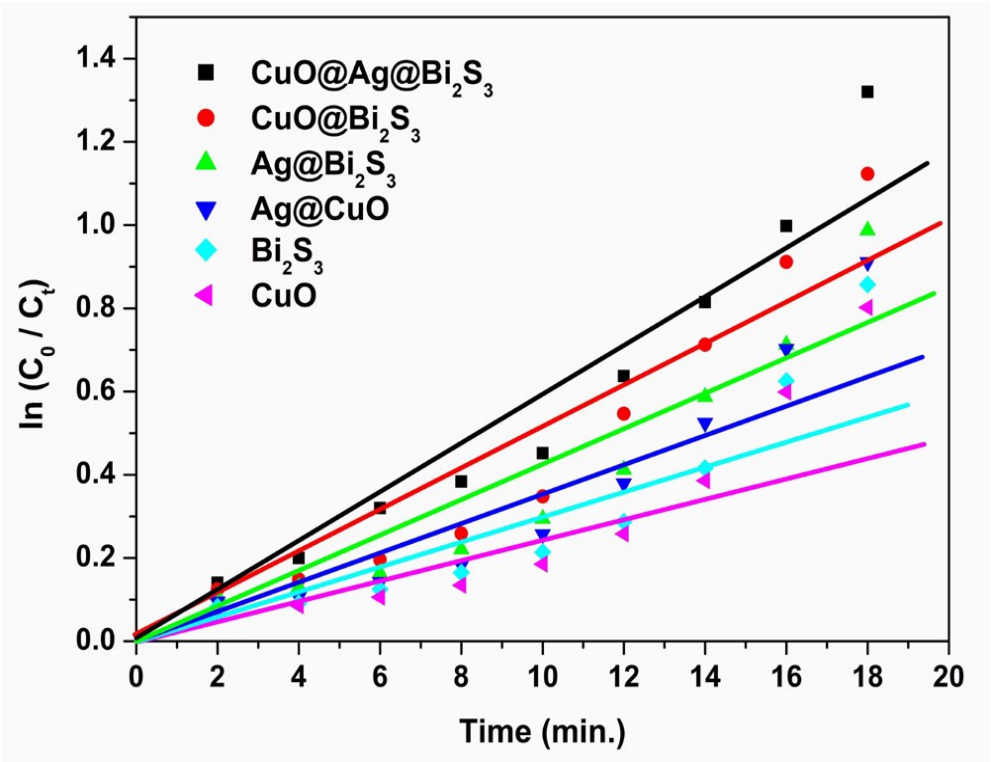
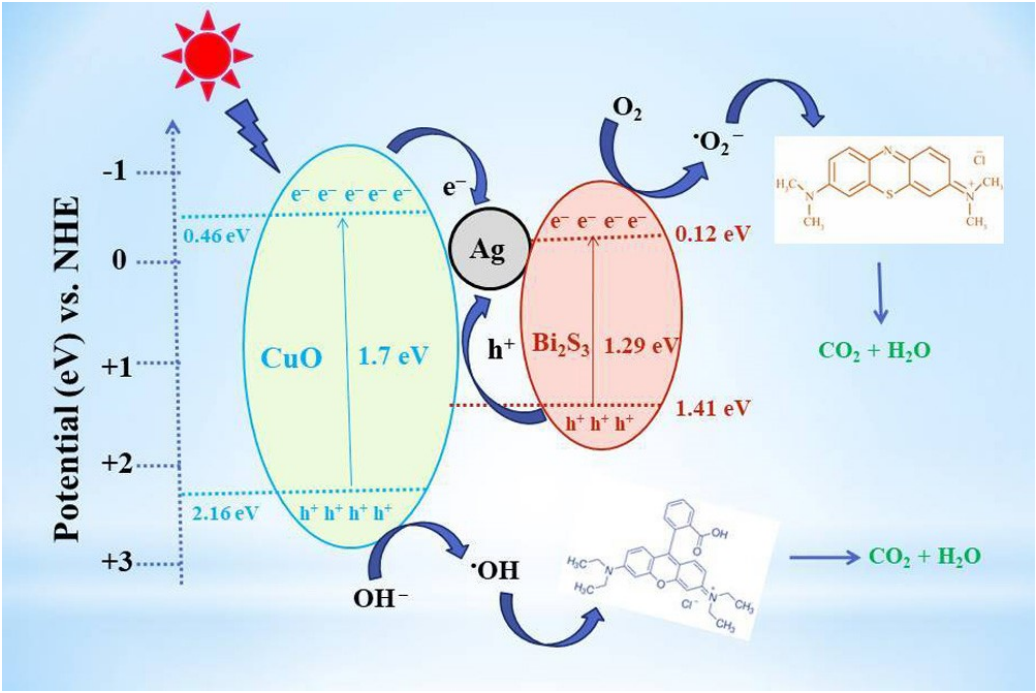

CuO@Ag@Bi2S3
CuO@Bi2S3
Ag@Bi2S3
Ag@CuO
Bi2S3
CuO
ln (C0 / Ct)
Time (min.)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
0
2
4
6
8
10
12
14
16
18
20

Figure S9


Potential (eV) vs. NHE
-1
0
+1
+2
+3
0.46 eV
2.16 eV
CuO
1.7 eV
e⁻ e⁻ e⁻ e⁻ e⁻
h⁺ h⁺ h⁺ h⁺
e⁻
Ag
h⁺
Bi2S3
1.29 eV
e⁻ e⁻ e⁻ e⁻
0.12 eV
1.41 eV
h⁺ h⁺ h⁺
O2
·O2⁻
OH⁻
·OH
CO2 + H2O
CO2 + H2O

Scheme S2