
ZnFe₂O₄@Cu-MOF 催化剂的制备及其 光催化性能研究

			ZnFe ₂ O ₄ /SBA-15	19	ZnFe ₂ O ₄ /SBA-15
	ZnFe ₂ O ₄		ZnFe ₂ O ₄		
			ZnFe ₂ O ₄ @Cu-MOF		
	ZnFe ₂ O ₄ @Cu-MOF	MO			
	ZnFe ₂ O ₄ @Cu-MOF	MO			
		ZnFe ₂ O ₄			Cu-MOF
	ZnFe ₂ O ₄ @Cu-MOF.		FT-IR XRD SEM TG		
	ZnFe ₂ O ₄ @Cu-MOF		MO		
	ZnFe ₂ O ₄ @Cu-MOF				
	20mL	4mmd	Zn CH ₃ COO ₂ · 2H ₂ O	6mmd	Fe NO ₃ · 9H ₂ O
10mL	9mmd		B	B	A
30min.	50mL			180	18h
	500	5h	ZnFe ₂ O ₄		
	0.557g	Cu NO ₃ · 3H ₂ O	0.2555g	0.4404g	15mL
10mL	5mL	DMF			
	90	24h		DMF	60
	10h	Cu-MOF.			
	ZnFe ₂ O ₄ @Cu-MOF				
	ZnFe ₂ O ₄ @Cu-MOF		ZnFe ₂ O ₄ Cu-MOF	4 1	

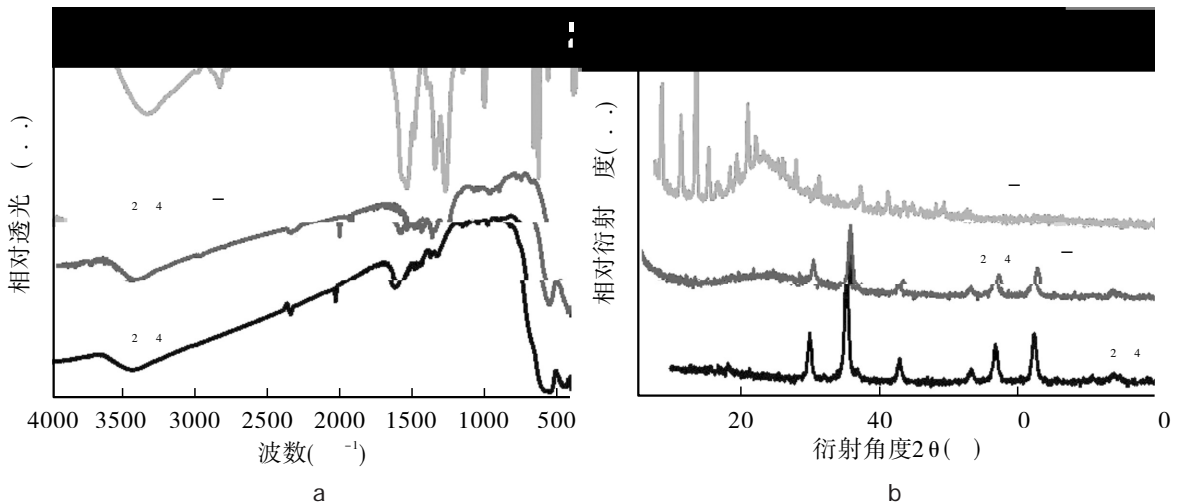
BBZM-III 380 ~ 800nm 350W FTO
 Ag/AgCl 0.2mol·L⁻¹ Na₂SO₄
 Mott-Schottky
 MO
 7mg 35mL 10mg/L MO -
 BL-GHX-V
 10min 5mL UV-2600
 MO 464m 10mg/L MO MO
 1 20 0 1

$$= \left(1 - \frac{\quad}{\quad}\right) \times 100\%$$

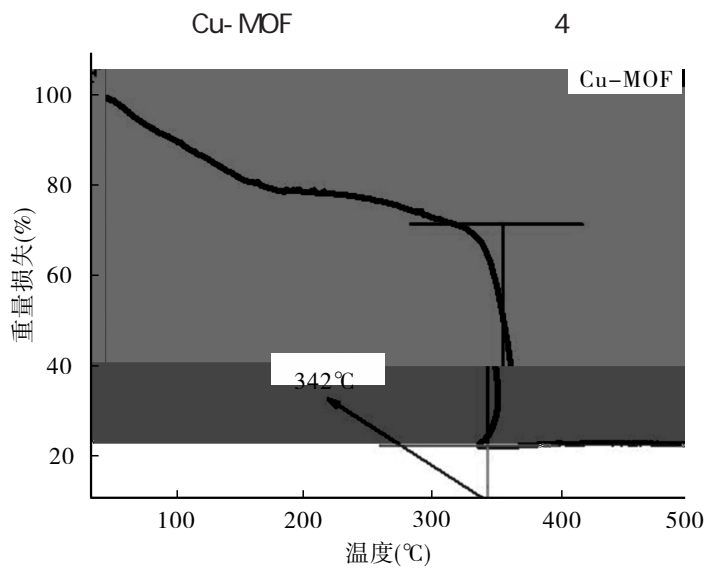
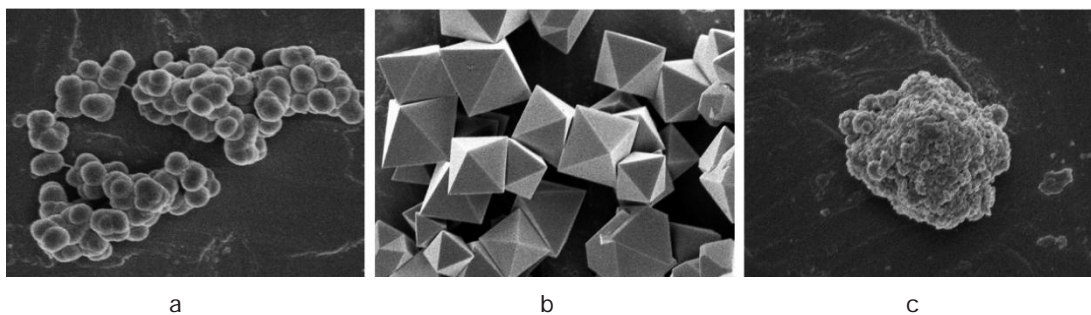
BQ OH⁻ EDTA-2Na SN IPA O₂⁻ h⁺ e⁻
 1mmol/L MO

FT-IR XRD SEM TGA
 ZnFe₂O₄@Cu-MOF

ZnFe₂O₄ ZnFe₂O₄ Cu-MOF ZnFe₂O₄@Cu-MOF 2 a
 544cm⁻¹ Fe-O 430cm⁻¹
 Zn-O 21 Cu-MOF 1565 ~ 1680cm⁻¹
 1370 ~ 1455cm⁻¹ 725cm⁻¹
 480cm⁻¹ Cu-O 22 Cu-O
 Cu-MOF Cu-MOF ZnFe₂O₄@Cu-MOF
 Cu-MOF



XRD	2 b	ZnFe ₂ O ₄	30.0°	35.4°
42.9° 53.3° 56.7° 62.4°		ZnFe ₂ O ₄	220	311 400
422 511 440 JCPDS 89-1010	¹⁵	Cu-MOF XRD	2 = 6.6°	
9.3° 11.5° 13.3° 14.5° 18.9° 20.1° 25.8° 29.3°		Cu-MOF	200	220 222
400 420 440 442 731 751	CCDC 280092 ²³	Cu-MOF		
ZnFe ₂ O ₄ @Cu-MOF	Cu-MOF			



4 Cu-MOF 100 342 100 ~ 340

Cu-MOF

ZnFe₂O₄ Cu-MOF ZnFe₂O₄@Cu-MOF ZnFe₂O₄@Cu-MOF

5 5 a ZnFe₂O₄

691nm Cu-MOF

ZnFe₂O₄@Cu-MOF

ZnFe₂O₄ Cu-MOF

Kubelka-Munk 2

$\frac{1}{2} 2^{25-26}$

5 b

24

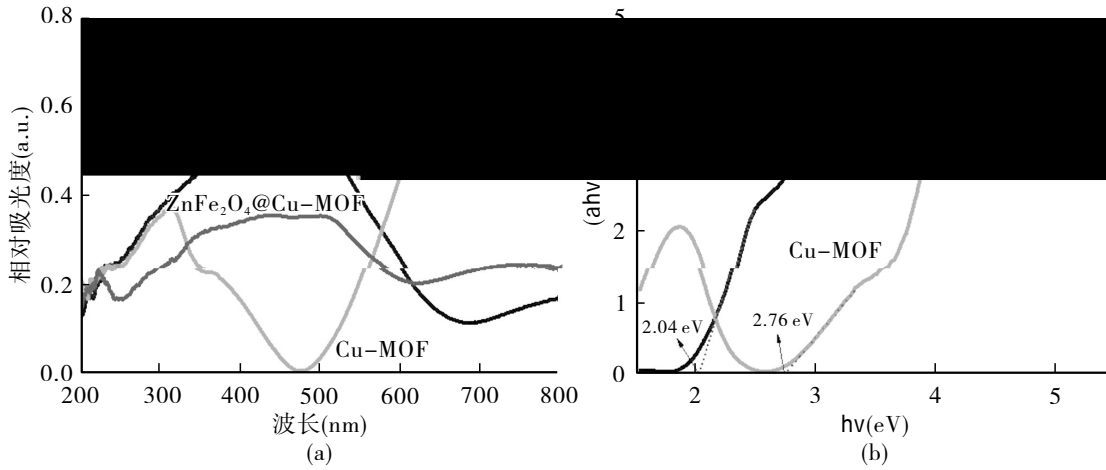
ZnFe₂O₄ Cu-MOF

g

2.04eV 2.76eV

$$\left(\frac{1}{2} \right)^{27} = \left(\frac{1}{2} \right)^g$$

2



ZnFe₂O₄ Cu-MOF

6

ZnFe₂O₄ Cu-MOF

ZnFe₂O₄ CB Cu-MOF

LUMO

-0.53eV -0.85eV vs NHE

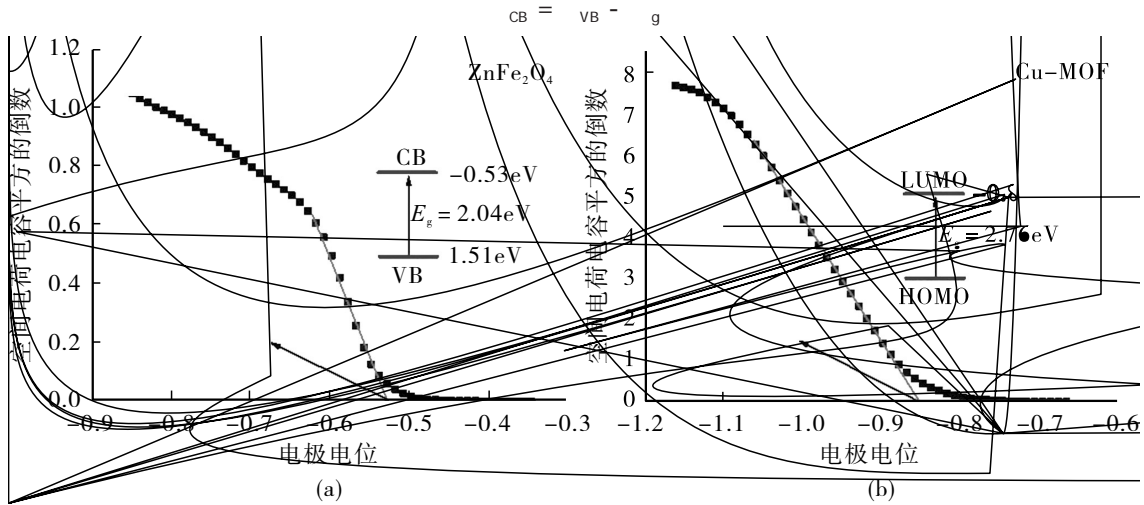
3

ZnFe₂O₄ VB

Cu-MOF HOMO

1.51eV 1.91eV vs NHE ²⁴

3



EIS

ZnFe₂O₄ Cu-MOF ZnFe₂O₄@Cu-MOF

7 a

EIS

Nyquist

27

ZnFe₂O₄@Cu-MOF Nyquist

ZnFe₂O₄ Cu-MOF

ZnFe₂O₄@Cu-MOF

ZnFe₂O₄ Cu-MOF

7 b

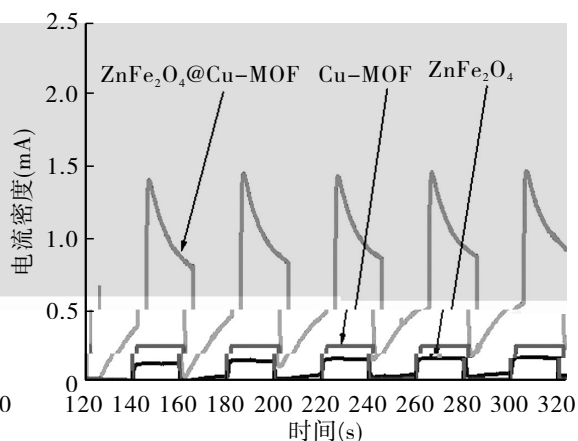
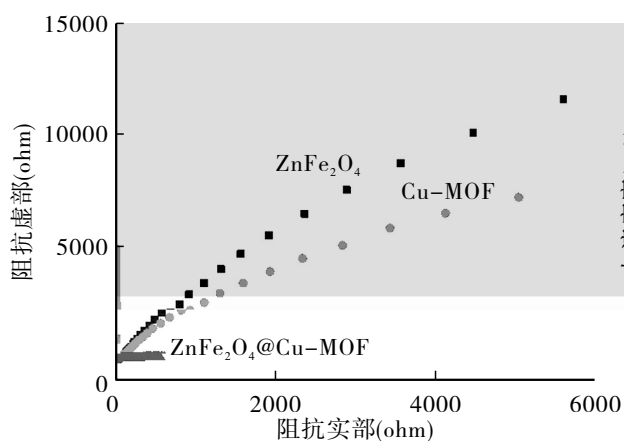
ZnFe₂O₄@Cu-MOF

ZnFe₂O₄

Cu-MOF

ZnFe₂O₄

Cu-MOF



(a)

(b)

ZnFe₂O₄ Cu-MOF

ZnFe₂O₄@Cu-MOF

	MO		8 a	120min	ZnFe ₂ O ₄	Cu-MOF	MO
	30.36%	58.72%	ZnFe ₂ O ₄ @Cu-MOF	MO			
78.68%	ZnFe ₂ O ₄	Cu-MOF	2.59	1.34	ZnFe ₂ O ₄ @Cu-MOF		

ZnFe₂O₄ Cu-MOF

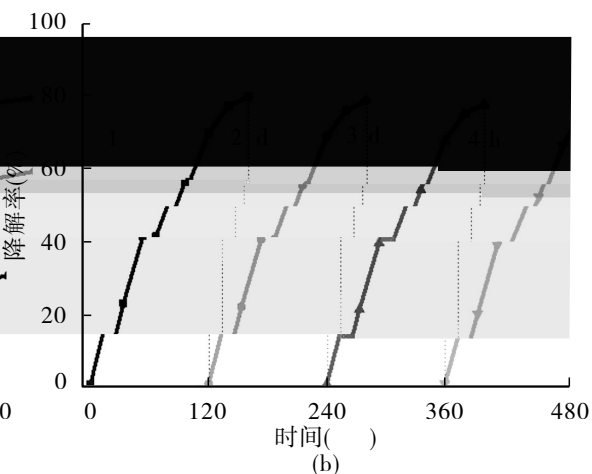
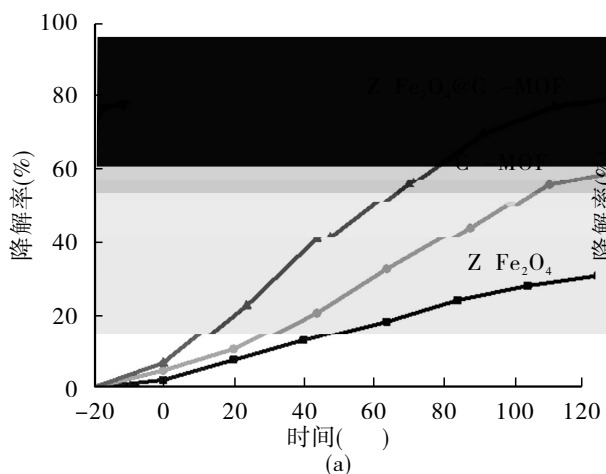
MO

ZnFe₂O₄@Cu-MOF MO

8 b

ZnFe₂O₄@Cu-MOF MO

3.70%

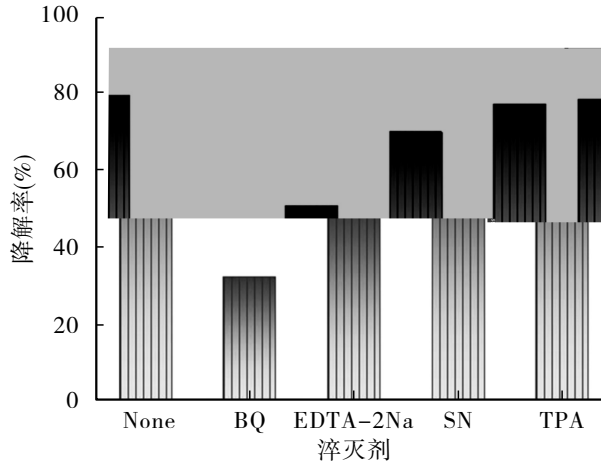


(a)

(b)

ZnFe₂O₄ Cu-MOF

ZnFe₂O₄@Cu- MOF MO
 9 BQ MO 32.0% MO O₂⁻
 EDTA- 2Na
 MO 50.3% h⁺ SN MO
 69.30% e⁻ IPA MO
 OH[·] ZnFe₂O₄@Cu- MOF MO O₂⁻ h⁺
 e⁻



ZnFe₂O₄ Cu- MOF
 ZnFe₂O₄@Cu- MOF MO 10 ZnFe₂O₄
 Cu- MOF e⁻ h⁺ Cu- MOF LUMO ZnFe₂O₄ CB e⁻ Cu- MOF
 LUMO ZnFe₂O₄ CB Cu- MOF HOMO ZnFe₂O₄ VB h⁺ Cu- MOF
 HOMO ZnFe₂O₄ VB e⁻ h⁺ ZnFe₂O₄ h

3

MO

CO₂ H₂O

MO

ZnFe

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Preparation and Photocatalytic Performance of ZnFe₂O₄@Cu-MOF

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Abstract

Keywords ZnFe₂O₄ Cu- MOF Methyl orange Photocatalysis Degradation