Supporting Information

Zeolite-Confined Ionic Liquid Enables On-Demand Active Bromine Generation for Thermally Robust and Reduced-Dosage Antimicrobial Materials

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1. Experimental section

1.1. Material characterization

The N_2 adsorption-desorption isotherms of the samples were obtained by specific surface analyzer (SSA-3700, China), and the samples were degassed at 120°C for 10 hours before the analysis. The morphology images were collected by scanning electron microscopy (SEM, JSM-7800 (Prime), Japan). Crystal structure was measured by XRD (Smartlab (9), Japan) in continuous mode at a speed of 1°/min. Fourier transform infrared (FTIR) spectrometer (Vertex 70, Germany) was used to determine the molecular structures of the samples. The chemical composition was measured by X-ray photoelectron spectrometer (XPS, ESCALAB 250Xi, America). The EPR spectra of DMPO captured reactive oxygen species were measured with EMXplus-9.5/12 (America). The ^{27}Al MAS NMR spectra were recorded on an 600WB spectrometer (Bruker, Switzerland), and Al $(NO_3)_3$ solutions were used as reference for the chemical shifts for ^{27}Al MAS NMR. Fourier-transform infrared spectra of adsorbed pyridine (Py-IR) were collected on Tensor 27 FT-IR spectrometer from Bruker. Specifically, the reduced sample was pressed into a pellet (diameter: 13 mm, weight: ca. 30 mg) and activated at 673 K for 90 min under vacuum of 10^{-2} Pa, and then the IR spectra were recorded at room temperature and 150°C. Pyridine vapor was introduced into the sample cell at room temperature for 30 min, followed by evacuation at 673 K for 30 min. Then, the spectra were recorded after evacuation. The spectra of adsorbed pyridine species can be obtained by subtracting the background spectra.

1.2. SEM images of bacterial morphology

The bacteria morphology was examined based on SEM characterization. After the bacteria were mixed with antibacterial materials 30 min, the bacteria were collected and fixed in glutaraldehyde aqueous solution (2.5%) overnight. Then the bacteria were dehydrated sequentially with 10, 30, 50, 70, 90, and 100% ethanol solutions for 15 min,

respectively. After natural drying, the bacteria were sputter-coated with platinum, and then observed by SEM.

2. Supplementary Figures and Tables

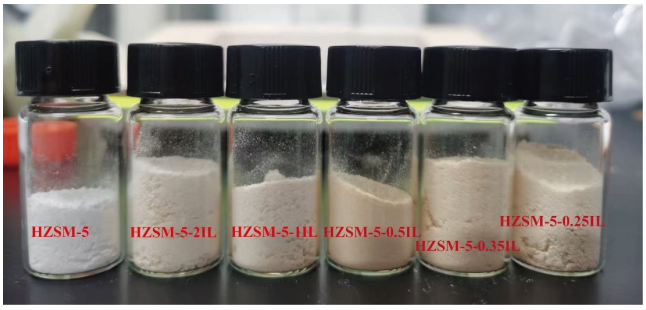

Figure S1. Color of HZSM-5-nIL composites.

Table S1. The specific surface area and pore volume of the samples.

Samples	BET surface area (m^2/g)	Pore volume (cm^3/g)	Dpore (nm)
HZSM-5	316.801	0.1638	2.00
HZSM-5-0.25IL	2.444	0.024	35.16
HZSM-5-0.35IL	2.338	0.019	27.91
HZSM-5-0.5IL	2.184	0.018	28.3
HZSM-5-1IL	2.218	0.018	28.57
HZSM-5-2IL	2.315	0.019	27.18

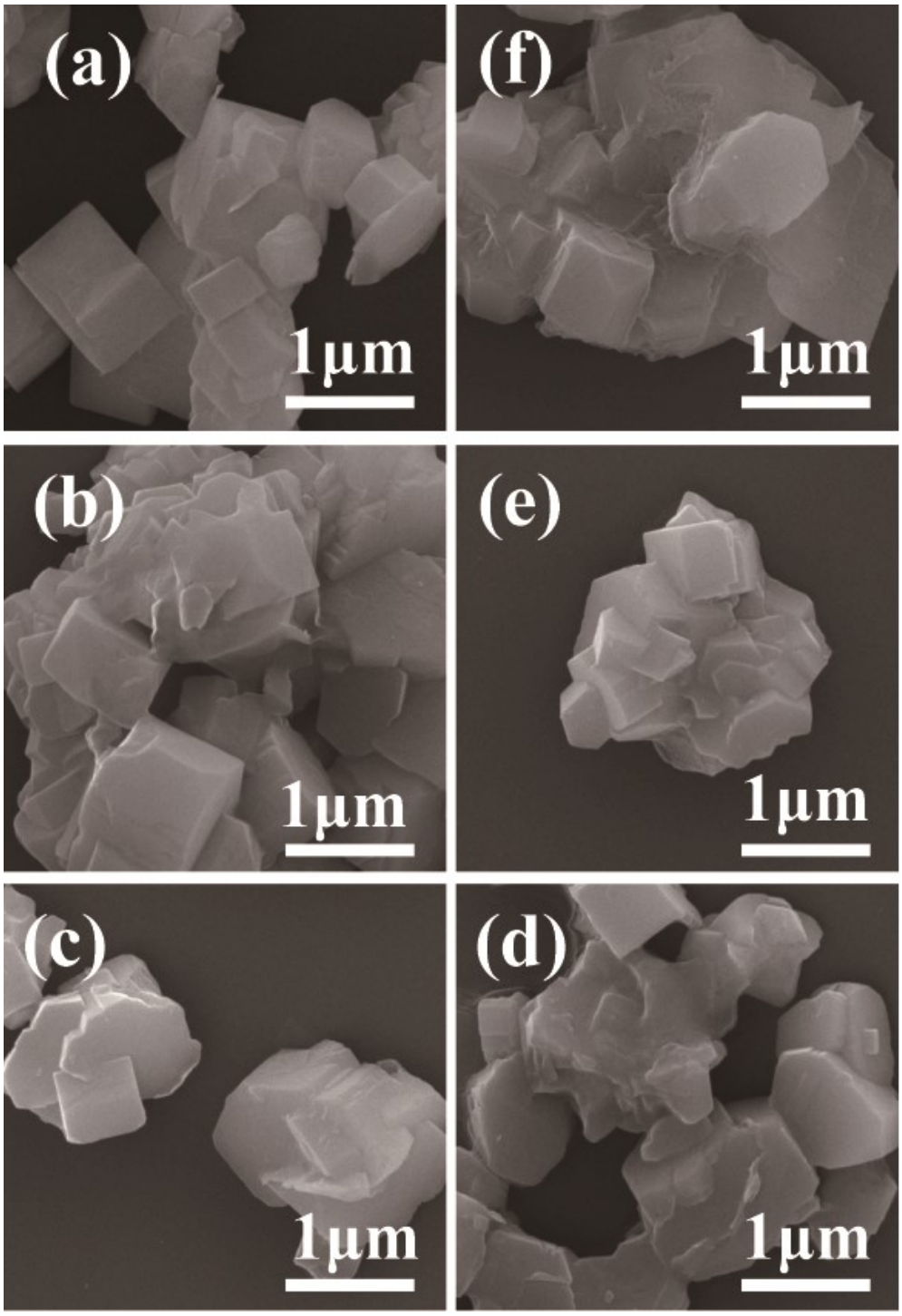

Figure S2. SEM images of HZSM-5-nIL composites.

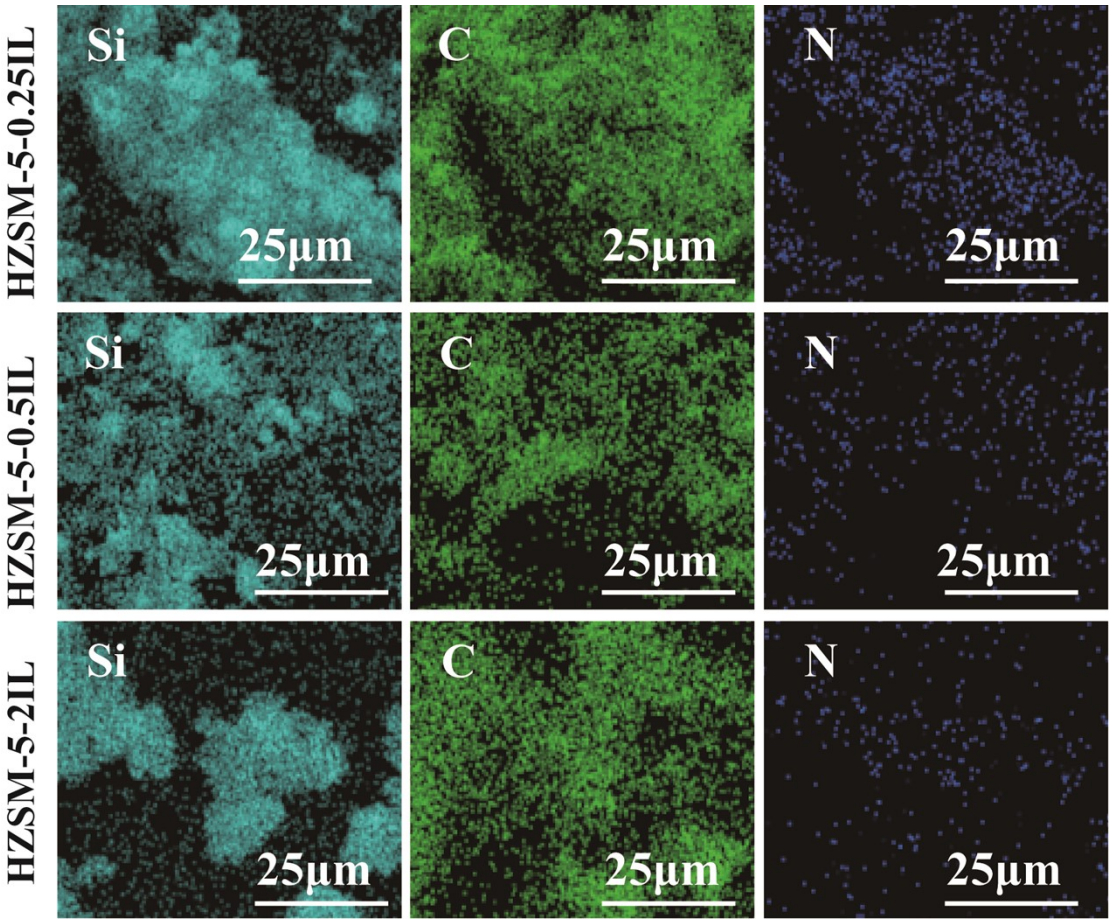

Figure S3. SEM-EDS mapping of HZSM-5-nIL composites.

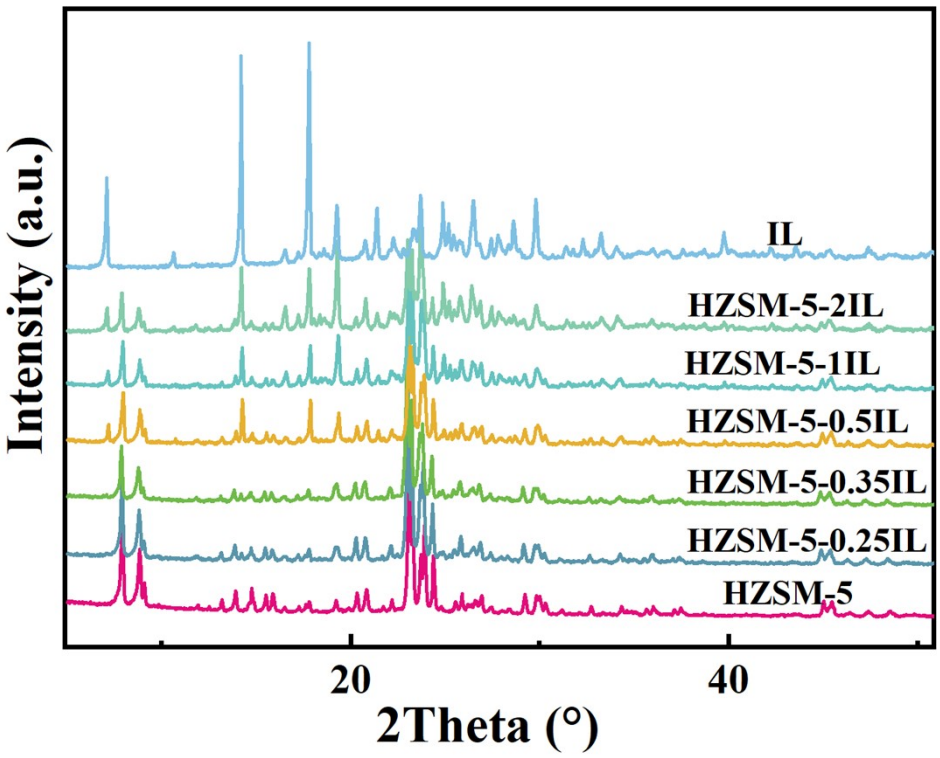

Figure S4. XRD patterns of HZSM-5-nIL composites.

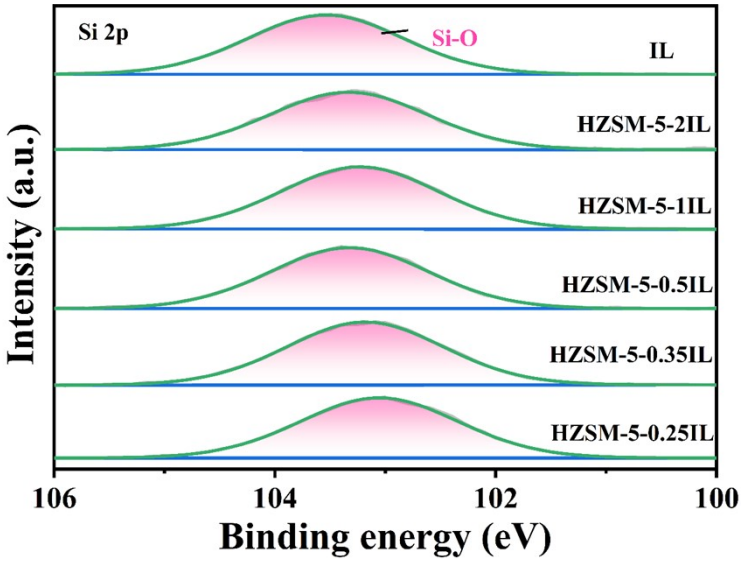

Figure S5. XPS spectra of Si 2p.

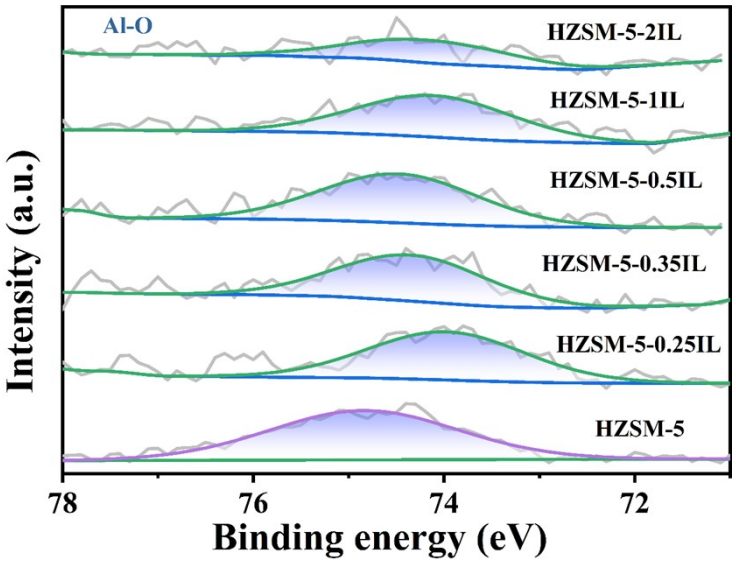

Figure S6. XPS spectra of Al 2p.

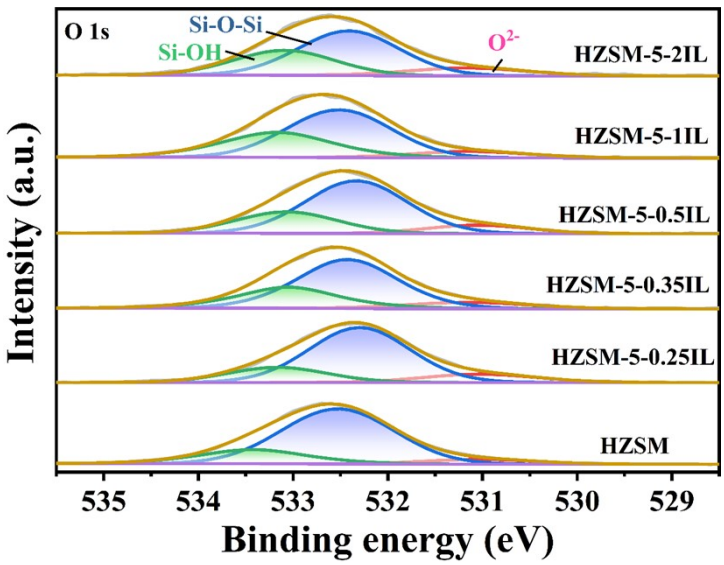

Figure S7. XPS spectra of O 1s.

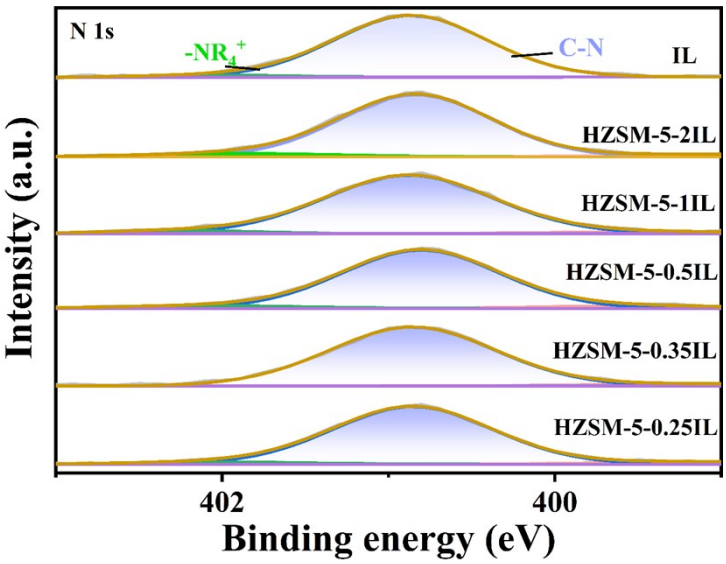

Figure S8. XPS spectra of N 1s.

Table S2. Inhibition Zone (mm) of HZSM-5, IL and HZSM-5-nIL composites.

organism	Inhibition Zone diameter (mm)						
	HZSM-5	HZSM-5-0.25IL	HZSM-5-0.35IL	HZSM-5-0.5IL	HZSM-5-1IL	HZSM-5-2IL	IL
S.aureus	/	26.81	28.58	32.81	32.46	47.28	28.58
MRSA	/	24.00	26.46	34.58	30.34	58.21	26.11
E.Coli	/	25.40	25.75	28.58	34.22	45.16	30.69
P. aeruginosa	/	20.04	21.34	23.11	22.55	24.71	18.05

Table S3. MIC and MBC (μg/ml) values of HZSM-5, IL and HZSM-5-nILcomposites

organism		HZSM-5	HZSM-5-0.25IL	HZSM-5-0.35IL	HZSM-5-0.5IL	HZSM-5-1IL	HZSM-5-2IL	IL
E.Coli	MIC	＞2048	64	32	16	16	8	8
	MBC	＞2048	64	32	16	16	8	16
S.aureus	MIC	＞2048	4	4	2	2	2	2
	MBC	＞2048	8	8	4	4	4	4
MRSA	MIC	＞2048	32	16	16	8	8	4
	MBC	＞2048	64	16	16	16	8	16
P. aerugino	MIC	＞2048	256	128	128	128	64	64
	MBC	＞2048	512	256	128	128	64	64

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