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Controlled size of Zn-MOF through ligands exchange and pore-tailored ZnO assemblies for size-selective gas sensing

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Table S1 Summary of grain size and gas sensing performance of ZnO

Sensing materials	Grain size (nm)	Optimum working temperature (°C)	Gas type-concentration (ppm)	Response value (S=Ra/Rg)
ZnO nanocrystals [1]	5.7	285	NO_2-40	45
	6.9	280	NO_2-40	277
ZnO nanocrystals [1]	26.1	280	NO_2-40	120
	36.8	290	NO_2-40	32
ZnO nanocrystals [1]	700	460	Acetone-100	9.5
	1000	420	Acetone-100	13
ZnO nanocrystals [1]	5000	200	NO_2-5	79
	2500	200	NO_2-5	22
ZnO particles [2]	400	200	NO_2-5	7
ZnO particles [2]	1700	450	Ethanol-100	3.2
ZnO particles [3]	2800	450	Ethanol-100	8.5
ZnO flakes [3]	4500	450	Ethanol-100	9.7
ZnO particles [3]				
ZnO assemblies [4]				
ZnO assemblies [4]				
ZnO assemblies [4]				

For better comparing the effect of grain size on gas sensing performance, we listed a summary. As exhibited in Table S1, when grain size is in quantum size, the response of ZnO sensors increase first and then decrease with the increase of size. However, when grain size is in micro-scale, the sensing performance improved with the increase of size, which could be attributed to stability of self-assembled structure of large grain and high activity.

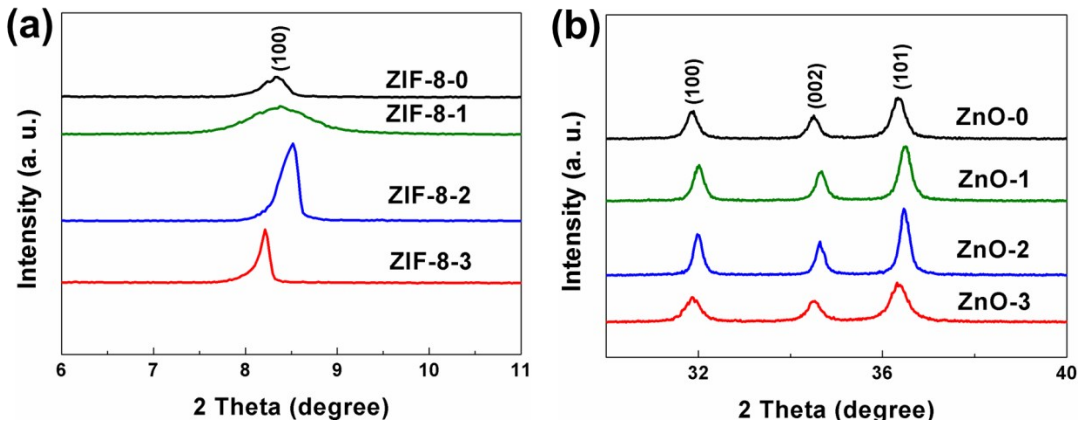

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Fig. S.1 (a) Comparison of (100) peaks of ZIF-8 precursors. (b) Comparison of (100), (002), (101) peaks of ZnO samples.

Particularly, the peaks of (100) in ZIF-8-0 and ZIF-8-1 precursors are weaker than the other precursors, indicating the lower crystallinity of ZIF-8-0 and ZIF-8-1. The diffraction peaks of (100), (002), (101) in all ZnO samples were almost similar, showing completed transformation from precursors to calcinated samples.

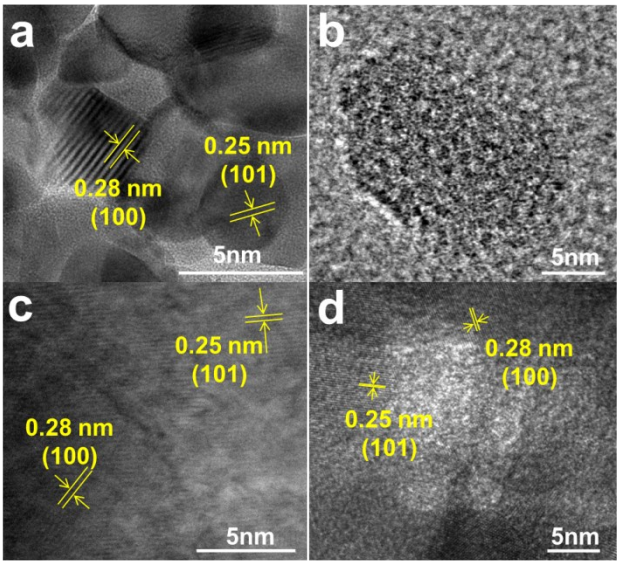

Fig. S.2 HRTEM images of (a) ZnO-0, (b) ZnO-1, (c) ZnO-2 and (d) ZnO-3.

The lattice fringes of ZnO samples are about 0.25 nm, 0.28 nm corresponding to the (101) and (100) facet of ZnO, respectively. The lattice fringes of ZnO-0, ZnO-2 and ZnO-3 are clearly exhibited due to the high crystallinity. While the lattice of ZnO-1 with smaller size is not been observed because of the melted structure resulted from the high energy electron beam.

References

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