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**Supporting Information** 

## Liquid metals for tuning gas sensitive layers

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**Fig. S1** The comparison of EGaIn particle size for three typical samples with different ratios: (a) 70% WO<sub>3</sub>-30% EGaIn (b) 50% WO<sub>3</sub>-50% EGaIn (c) 30% WO<sub>3</sub>-70% EGaIn.



**Fig. S2** Statistical distribution, average size and standard deviation of three samples with different ratios: (a) 70% WO<sub>3</sub>-30% EGaIn has an average size of 1.53  $\mu$ m and a standard deviation of 0.41, (b) 50% WO<sub>3</sub>-50% EGaIn has an average size of 2.12  $\mu$ m and a standard deviation of 0.56, and (c) 30% WO<sub>3</sub>-70%EGaIn has an average size of 2.6  $\mu$ m and a standard deviation of 0.64. A left shift indicates the size increases, when mixing with more WO<sub>3</sub>.



Fig. S3 Cross-sectional SEM images of three typical 70% WO $_3$ -30% EGaIn samples.



**Fig. S4** The size repeatability of three 70% WO<sub>3</sub>-30% EGaIn samples: (a) has an average size of 1.55  $\mu$ m and a standard deviation of 0.46, (b) has an average size of 1.52  $\mu$ m and a standard deviation of 0.49, and (c) has an average size of 1.61  $\mu$ m and standard deviation of 0.50.



Fig. S5 Mott-Schottky plots of different samples with different ratios of  $WO_3$  and EGaIn.



Fig. S6 XPS spectra of indium for different samples with different ratios of  $WO_3$  and EGaIn.



Fig. S7 Dynamic response of  $70\%WO_3$ -30%EGaIn sample to 0.4% H<sub>2</sub> gas at different temperatures.



**Fig. S8** Measured selectivity of 70%WO<sub>3</sub>-30% EGaIn sample towards (a)  $H_2S$  gas (5.2 ppm, 10.3 ppm) and (b)  $NO_2$  gas (3.6 ppm, 5.4 ppm) at 400 °C.

	Resistance trend	Concentration	Response factor
H <sub>2</sub>	$\downarrow$	0.4%	33.2
		0.8%	38.9
H₂S	$\downarrow$	5.2 ppm	1.8
		10.3 ppm	2.5
$NO_2$	1	3.6 ppm	4.4
		5.4 ppm	5.5

**Table S1** Gas sensing performance of 70% WO<sub>3</sub>-30% EGaIn sample to different gases at 400  $^{\circ}$ C and resistance trend.