

Supplementary material

A novel cataluminescence sensor for rapid detection of methanol at low working temperature based on Ni/CeO₂ catalyst

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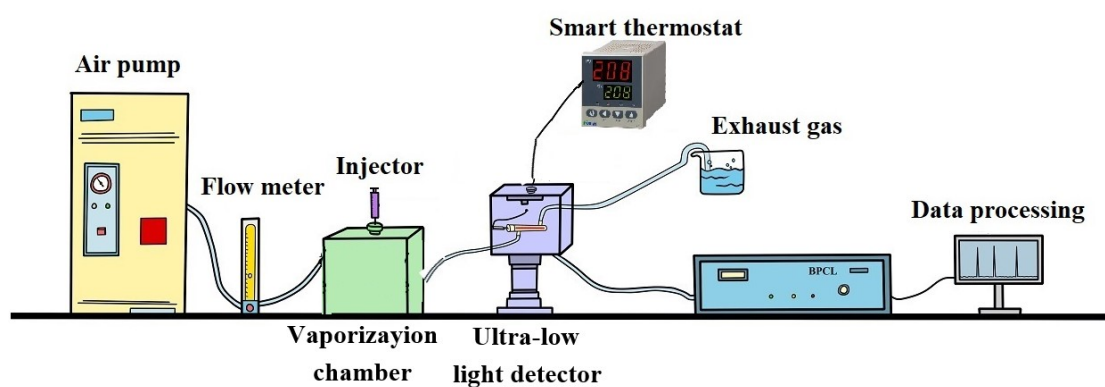


Fig. S1. Schematic diagram of the CTL sensing equipment for the determination of methanol.

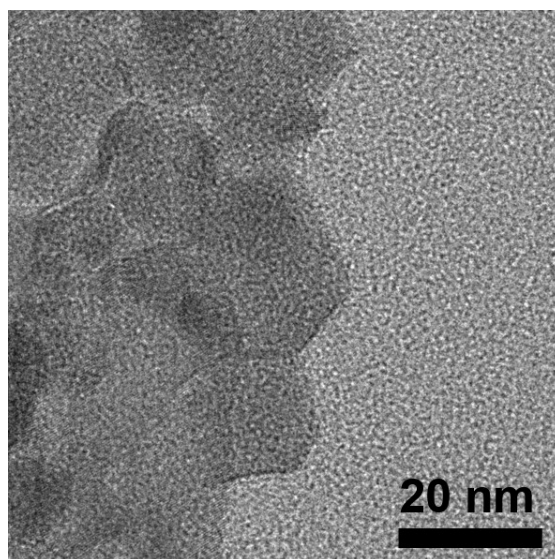


Fig. S2. TEM image of pure CeO₂.

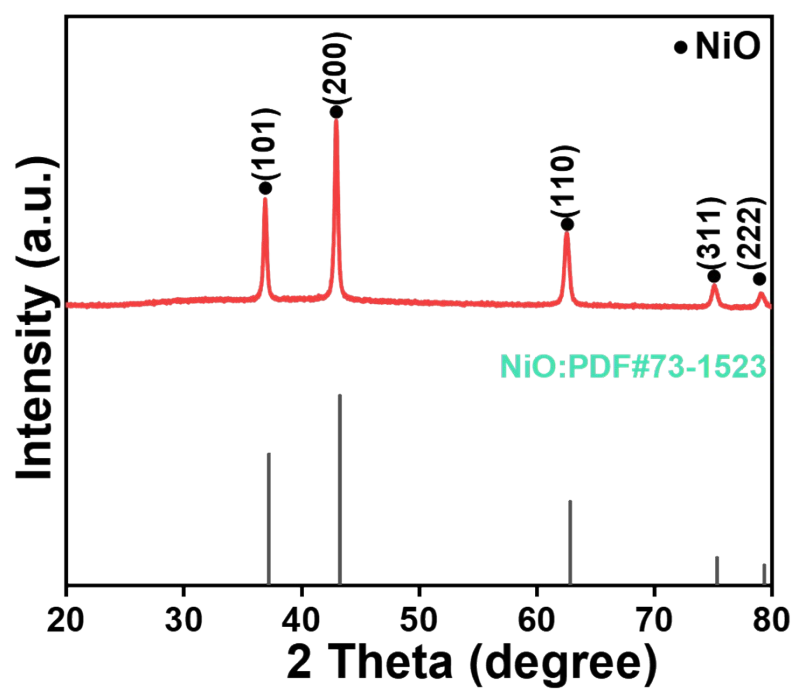


Fig. S3. XRD patterns of NiO.

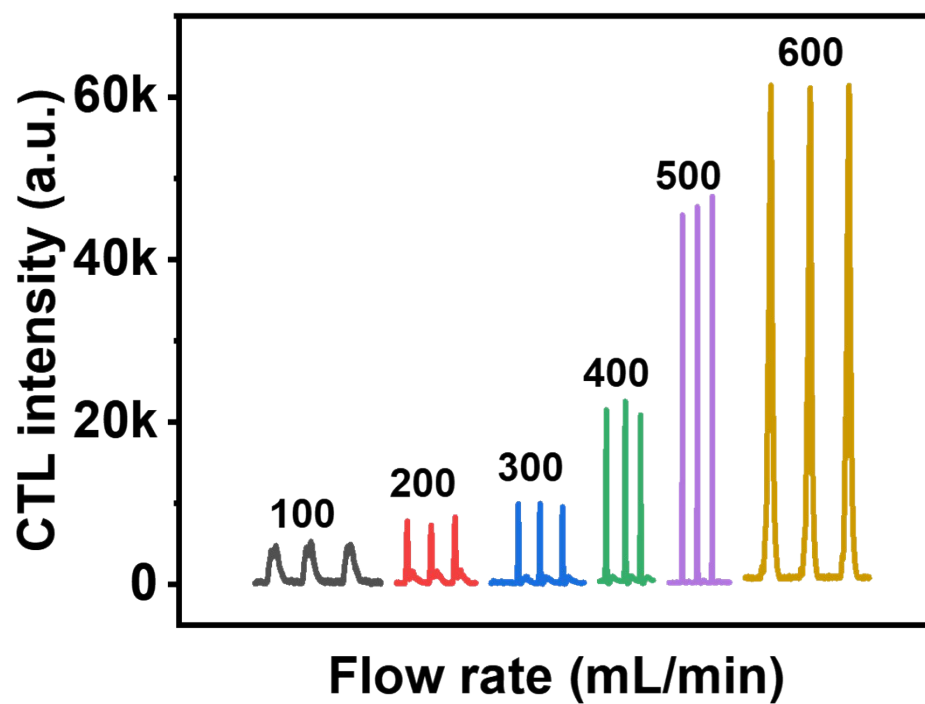


Fig. S4. Effect of air flow rate on the CTL intensity of the proposed CTL sensor.
Carrier gas: air, working temperature: 190 °C, and injection sample: pure methanol.

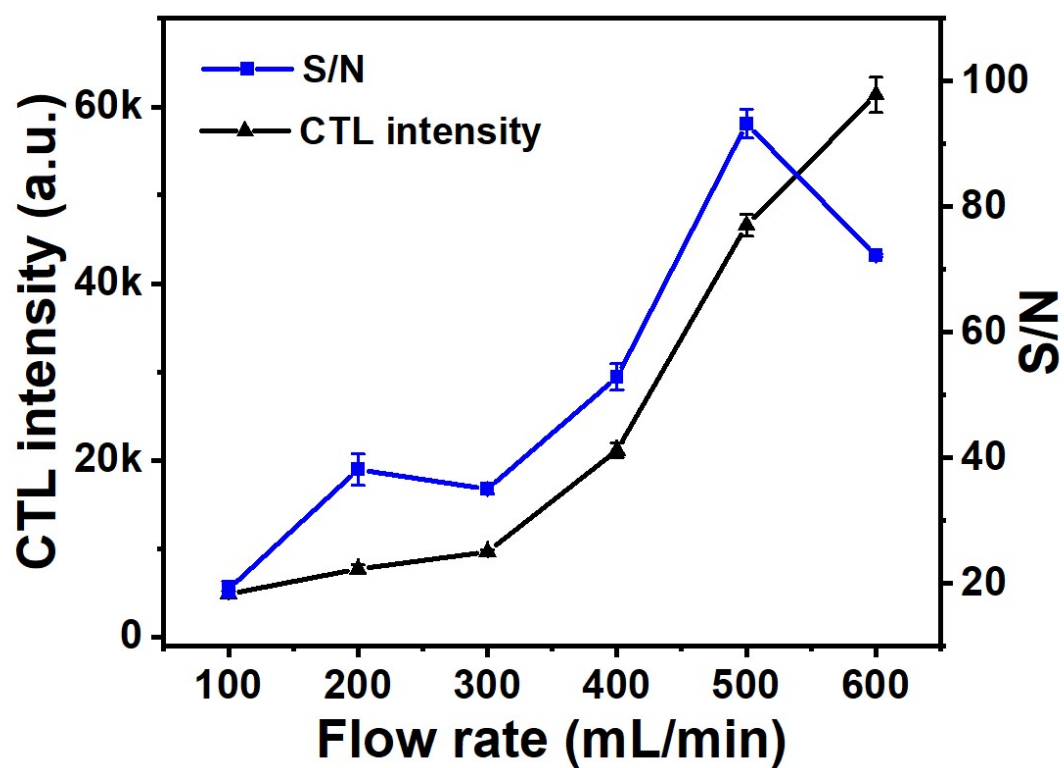


Fig. S5. Effect of air flow rate on the S/N value of the proposed CTL sensor. Carrier gas: air, working temperature: 190 °C, and injection sample: pure methanol.

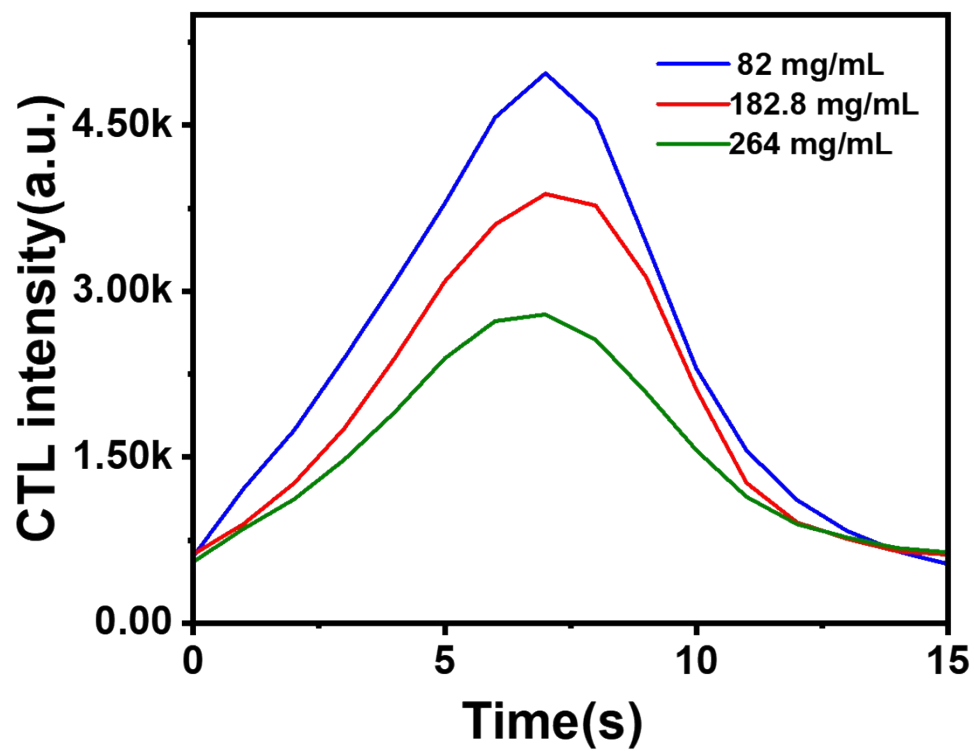


Fig. S6. Representative CTL dynamic response patterns for methanol detection by using the proposed CTL sensor.

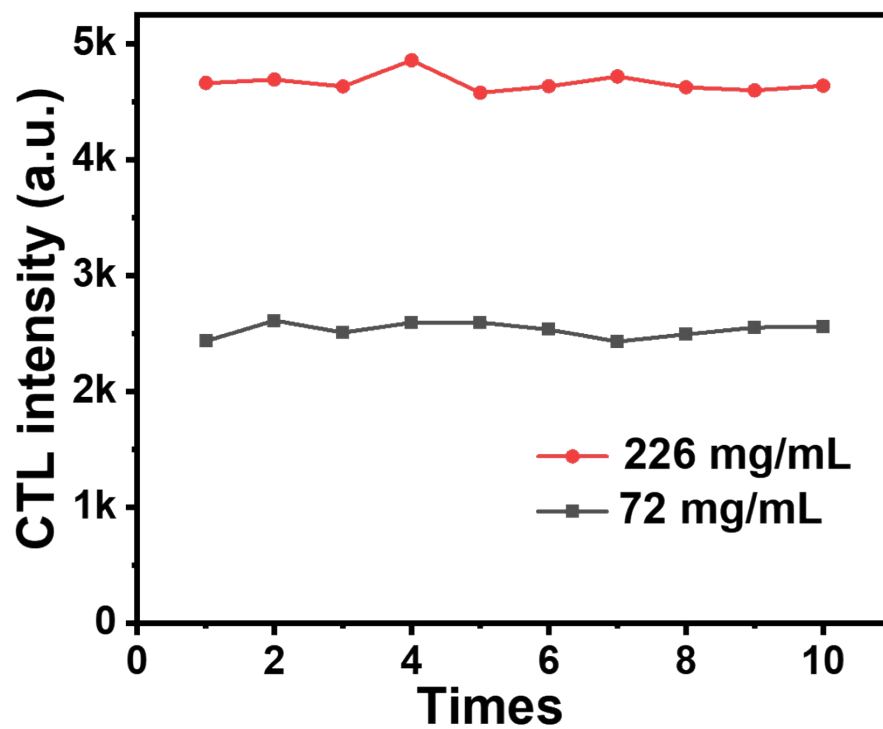


Fig. S7. CTL signals from the proposed sensor for the detection of 72 and 226 mg/mL methanol, respectively ($n = 10$).

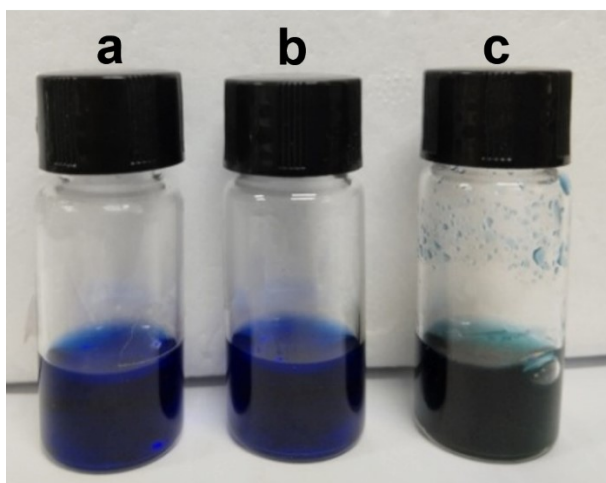


Fig. S8. Photographs of BTB solution when it reacted with the tail gas from the CTL reaction of methanol on the surface of Ni/CeO₂ catalyst. (a) blank group, without any processing procedure; (b) control group, the solution adsorbed the air carrier gas; (c) experimental group, the solution adsorbed the tail gas of CTL reactions of methanol on the surface of Ni/CeO₂ catalyst.

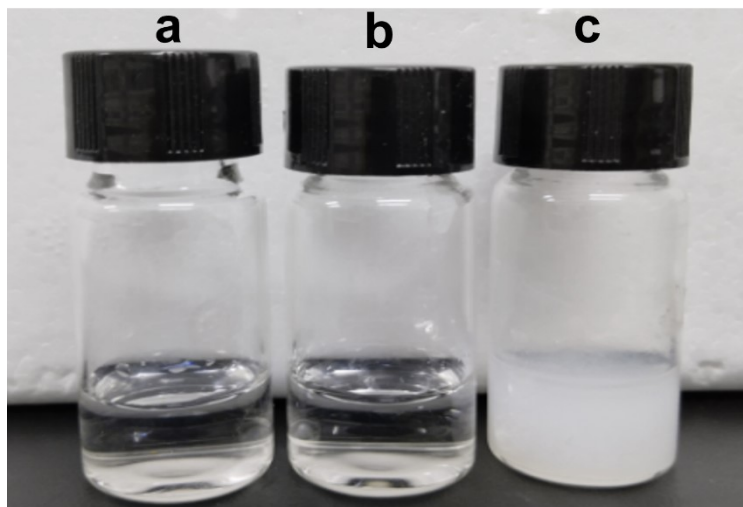


Fig. S9. Photographs of $\text{Ca}(\text{OH})_2$ solution when it reacted with the tail gas from the CTL reaction of methanol on the surface of Ni/CeO_2 catalyst. (a) blank group, without any processing procedure; (b) control group, the solution adsorbed the air carrier gas; (c) experimental group, the solution adsorbed the tail gas of CTL reactions of methanol on the surface of Ni/CeO_2 catalyst.

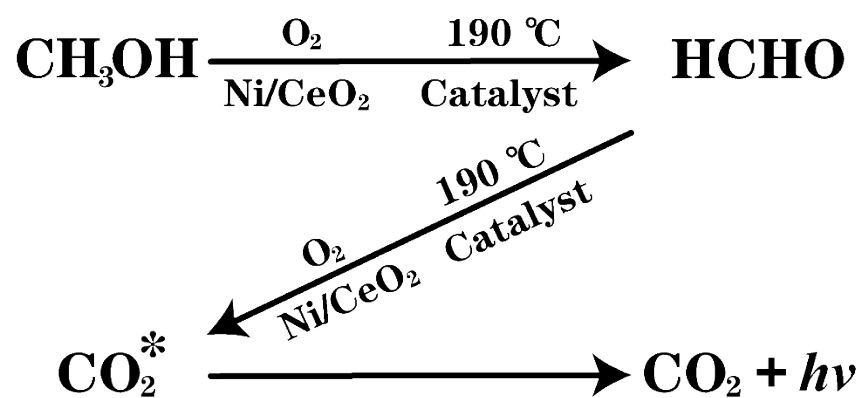


Fig. S10. Possible mechanism for the CTL reaction of methanol on the surface of Ni/CeO₂ catalyst.

Table S1 Comparison of different methanol sensors based on CTL

Sensing material	Working temperature (°C)	Detection limit	Reaction time (s)	Recovery time (s)	Ref.
ZnO thin film	275	500 ppm	280	135	1
CuO thin film	350	500 ppm	235	225	2
Al-doped NiO nanotubes	325	200 ppm	199	15	3
TiO ₂ -Y ₂ O ₃	185	8.58 mg/m ³	10	60	4
Ni/CeO ₂	190	0.7 mg/mL	7	6	This work

References

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