Supplementary Data

Multilayer $(Cr/Au)^n$/PAA Nanoporous Membrane for Ultrafast, Selective CO_2 Detection at Room Temperature

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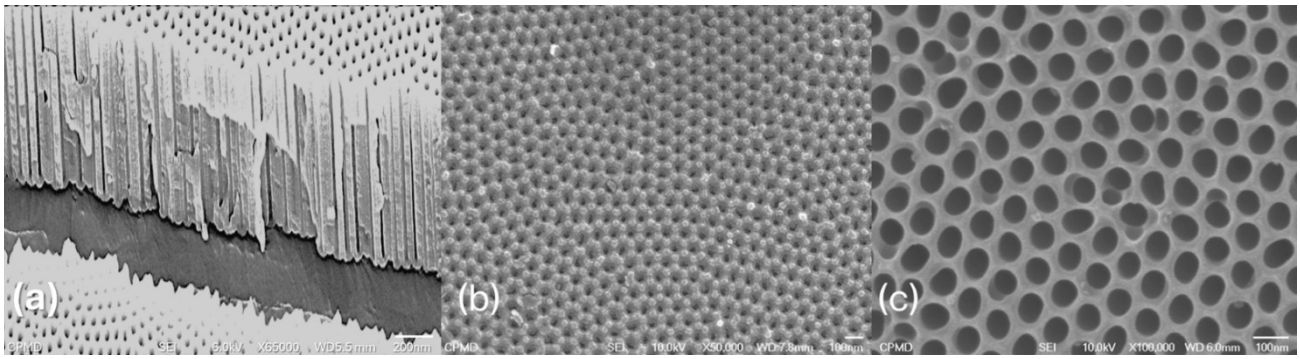
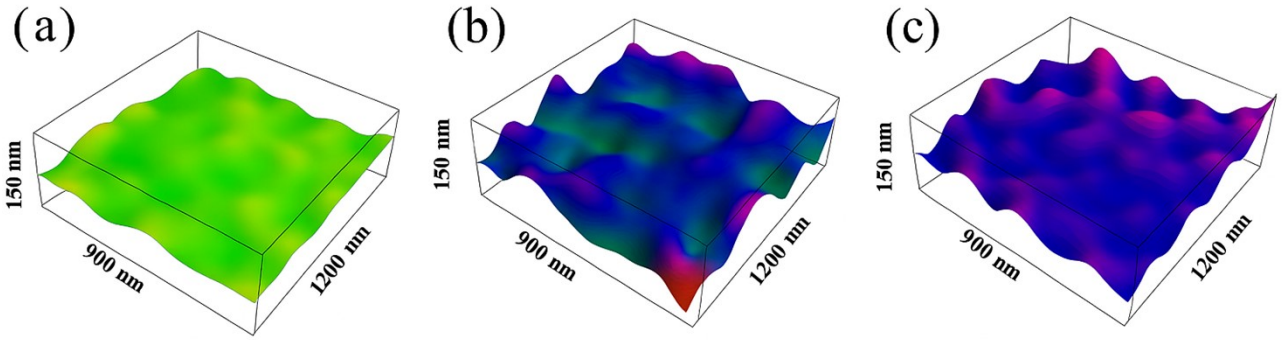


Fig. S1. SEM images of the AAO membrane showing (a) a cross-sectional view, (b) a top view of the initial structure, and (c) the membrane after undergoing 60 minutes of pore widening.



Cr/Au/PAA
$R_a = 0.895$ nm
$R_q = 1.133$ nm
$R_t = 14.875$ nm

$(Cr/Au)_2$/PAA
$R_a = 1.937$ nm
$R_q = 2.413$ nm
$R_t = 20.616$ nm

$(Cr/Au)_3$/PAA
$R_a = 1.854$ nm
$R_q = 2.354$ nm
$R_t = 22.975$ nm

Fig. S2. 3D roughness profiles of Cr/Au-coated PAA membranes with increasing bilayer repetitions: (a) Cr/Au/PAA, (b) $(Cr/Au)^2$/PAA, and (c) $(Cr/Au)^3$/PAA. Surface roughness increases

with layering, enhancing active area and interface complexity—favorable traits for efficient CO_2 sensing.

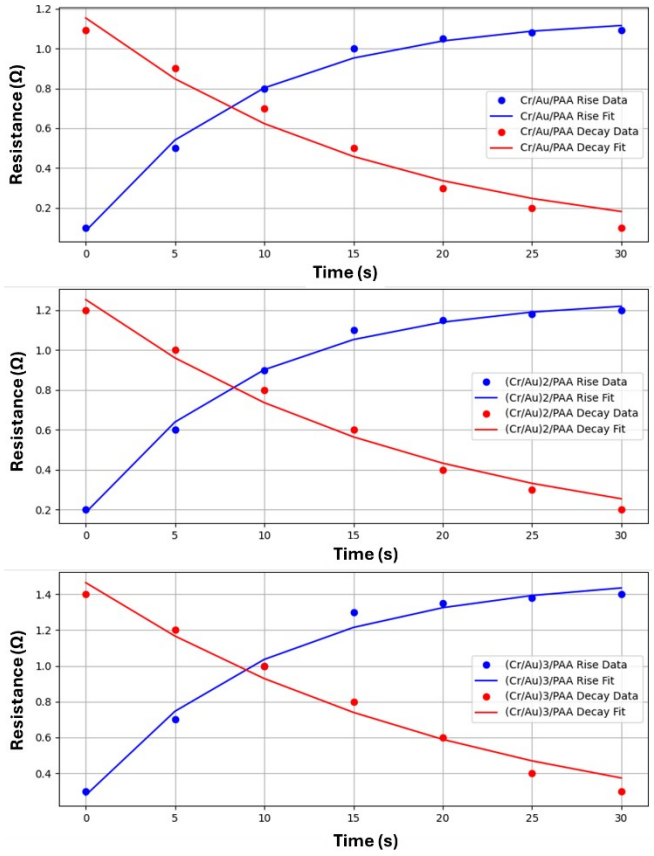


Fig. S3. Both rise and decay phases fitted with exponential models for (a)Cr/Au/PAA, (b) $(Cr/Au)^2$/PAA, and (c) $(Cr/Au)^3$/PAA sensors at 4440 ppm CO_2.