

Supporting Information

Long-range ordered TiO₂/Au hollow urchin: Topology control for maskless electrodeposition

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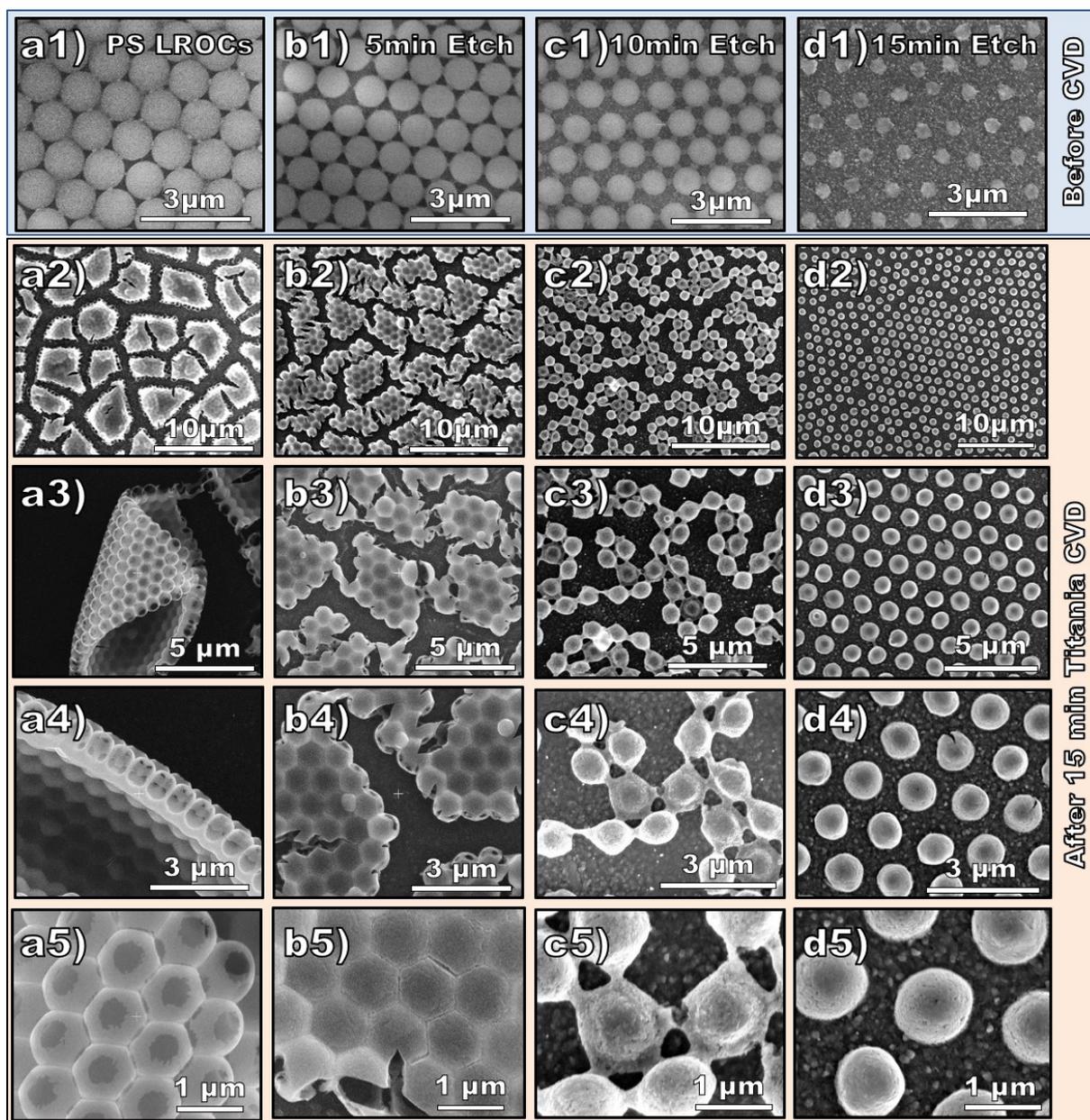


Figure S1. SEM images of PS LROCs before and after 15 min TiO_2 CVD following by 550°C calcination for 1 hr for **a)** PS LROCs and after oxygen plasma etching for **b)** 5, **c)** 10 and **d)** 15 mins.

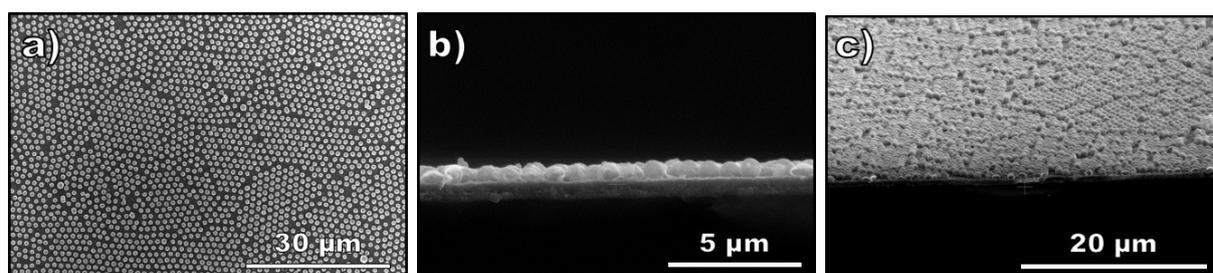


Figure S2. SEM images of titania LROCs after calcinations **a)** low magnification **b)** side view, and **c)** 30° angle view. These images show the uniformity of the developed TiO₂ monolayered structures covering a large surface area of the samples.

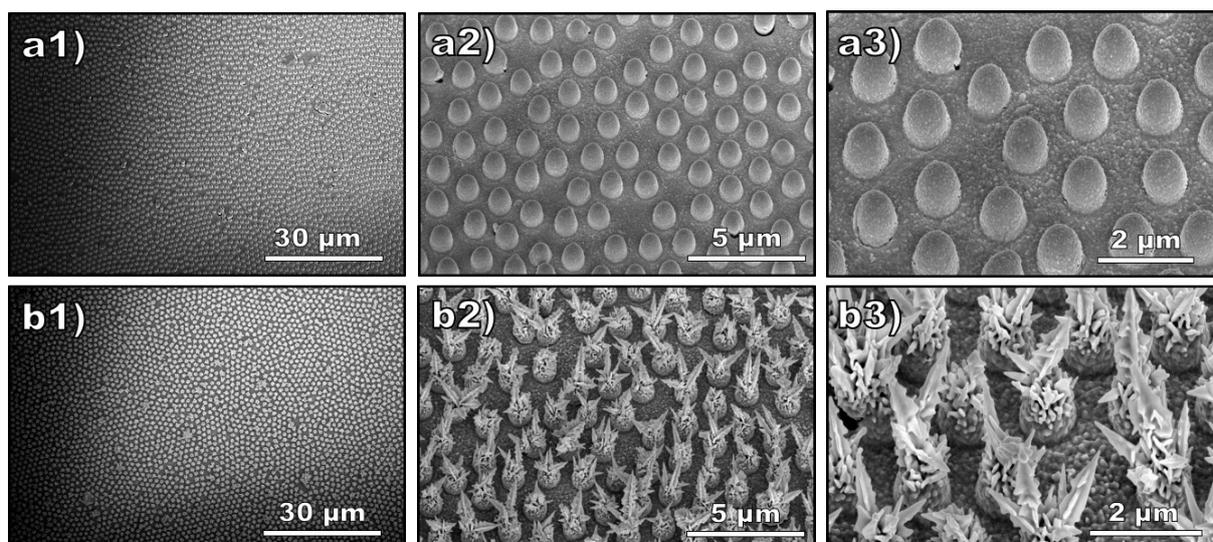


Figure S3. Low and high magnification SEM images of TiO₂/Au LROCs **a)** before electrodeposition and **b)** after 12 mins spike electrodeposition; the spikes only grow on TiO₂ LROCs and the area between the colloids show no formation of gold spikes.

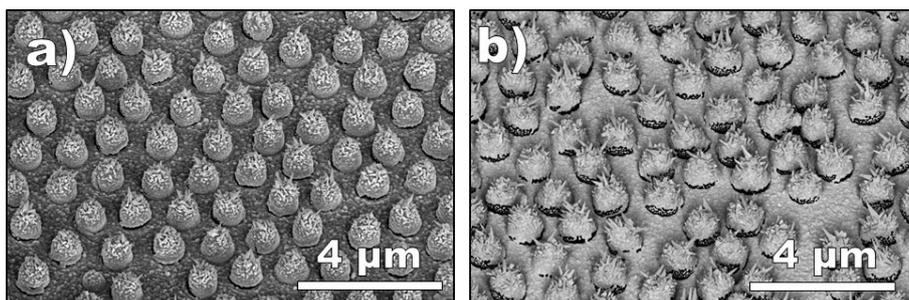


Figure S4. **a)** Secondary and **b)** backscatter SEM images of TiO_2/Au urchin LROCs electrodeposited for 9 mins. The light areas in the backscatter image are showing the Au deposited areas with the dark areas directly under the spheres representing TiO_2 .

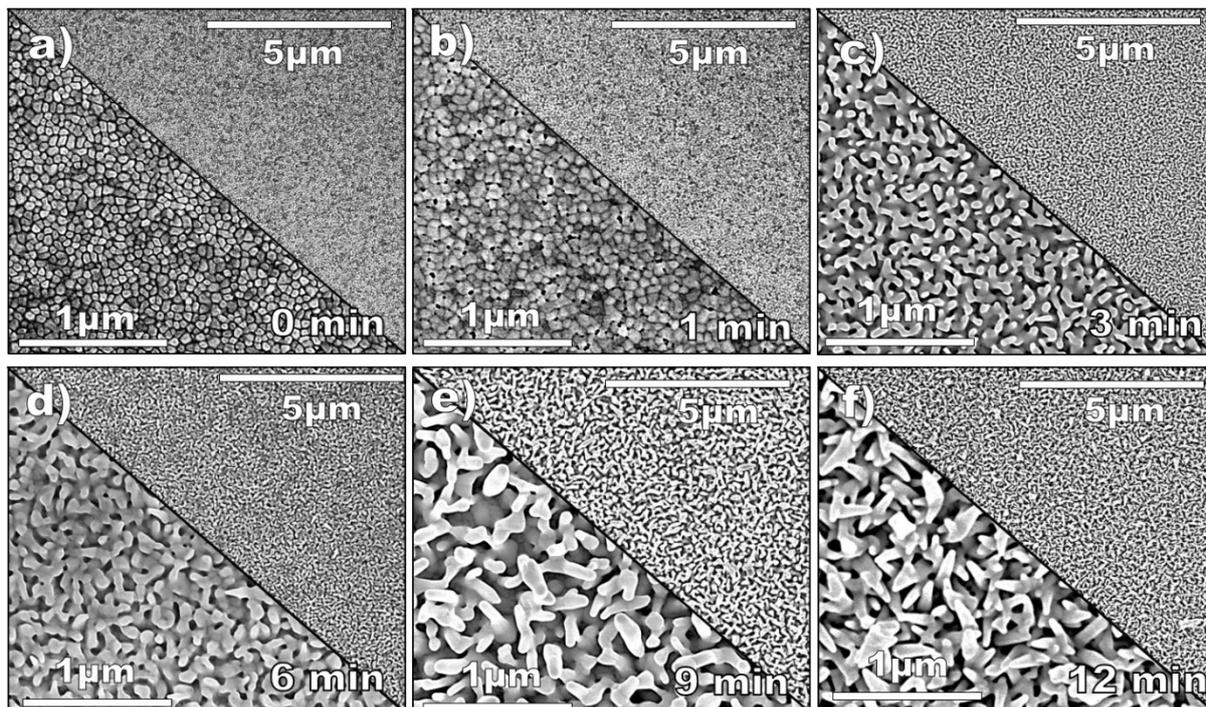


Figure S5. SEM images of Au spikes electrodeposited on Si/Au (150 nm) substrates for **a)** 0, **b)** 1, **c)** 3, **d)** 6, **e)** 9 and **f)** 12 mins after e-beam evaporation.

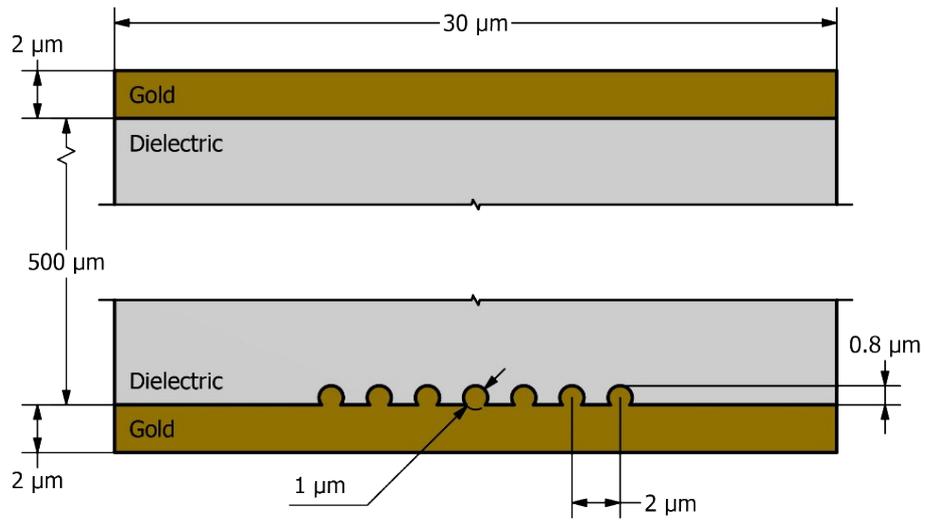


Figure S6. Schematics of the FEM model used for studying the electrical potential and field generated between two parallel electrodes with flat and spherical LROCs on one of the electrodes.

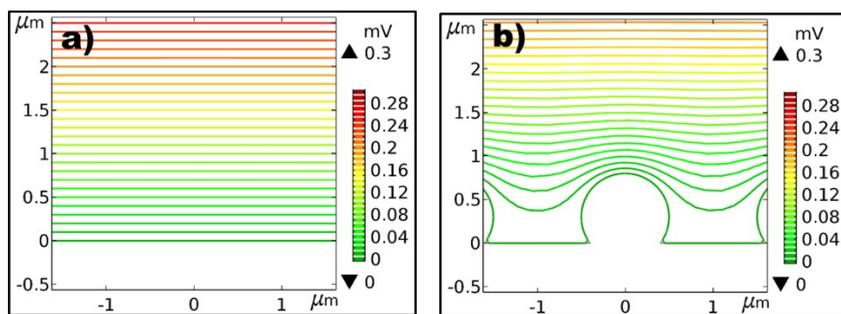


Figure S7. FEM model of electrical potentials for **a)** flat Au and **b)** ordered spherical LROCs considering complete conductive layers.

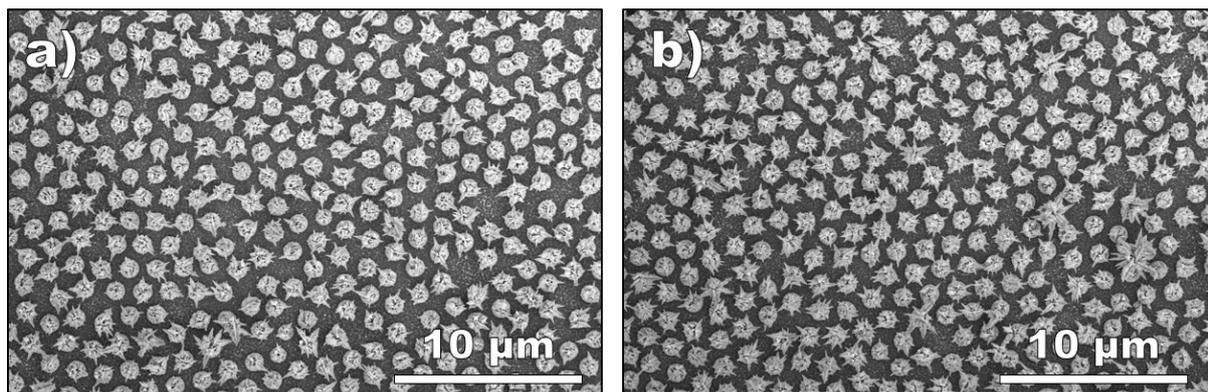


Figure S8. Low magnification SEM images of TiO₂/Au urchin LROCs after 9 mins electrodeposition a) as produced; and , b) after 3 months of testing.

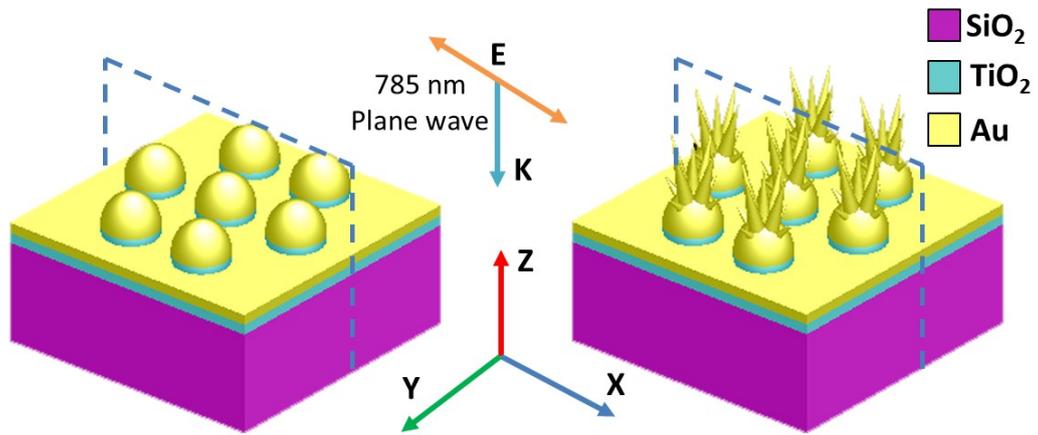


Figure S9. The simulated LROC unit cells used for TiO₂/Au and TiO₂/Au urchin LROCs. The dashed plane is the slicing 2D plane where the FDTD simulation was performed on the middle micro-shell in the structure.

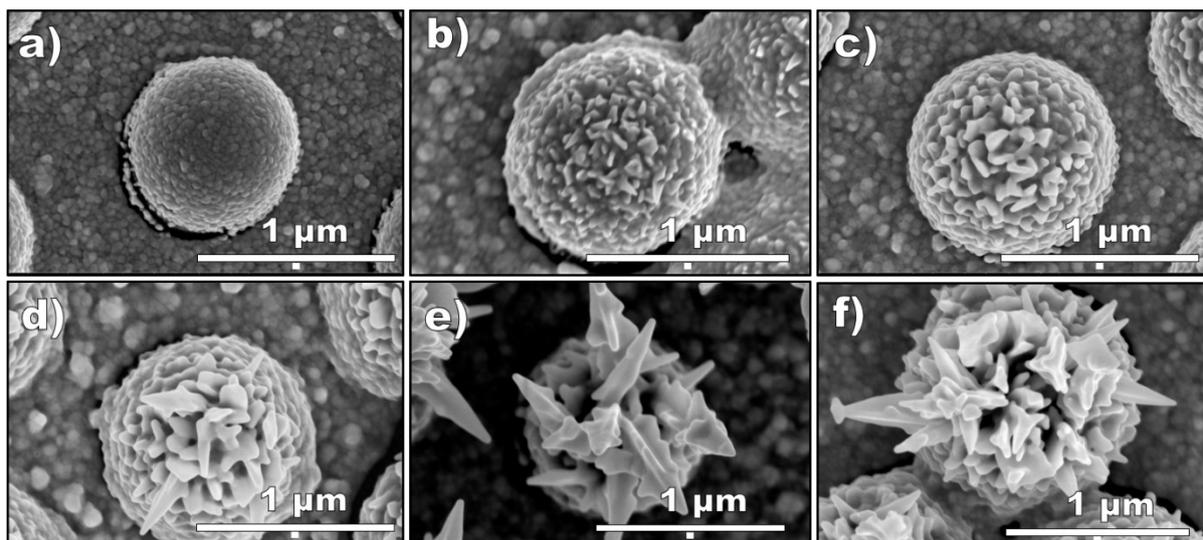


Figure S10. High magnification SEM images of the individual TiO_2/Au LROCs with Au electrodeposition times of **a) 0**, **b) 1**, **c) 3**, **d) 6**, **e) 9** and **f) 12** mins.