

Electronic Supplementary Information

Stretchable, Transparent and Molecular Permeable Honeycomb Electrodes and Their Hydrogel Hybrids Prepared by Breath Figure Method and Sputtering of Metals

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S-1. Experimental set up of resistance measurement

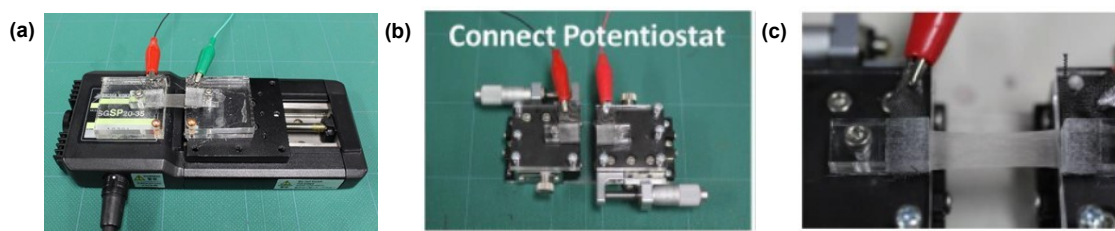


Figure S-1. Photographs of experimental set up of tensile test (a), and mobile stages for fixing honeycomb electrodes (b) and (c).

Experiments

Two end of a honeycomb electrode fixed on a PDMS sheet was clamped on mobile stages of hand made tensile test equipment (SGSP-20-35, GSC-01, SIGMA Koki, Co. Ltd., Japan), and stretched unidirectionally. Current values were simultaneously measured with applying 1 V onto the stretching electrodes by using a potentiostat and calculated resistance change by using Ohm's law ($R=V/I$, where R, V and I are resistance, voltage and current values, respectively).

To evaluate the stability of honeycomb electrodes, resistance changes of honeycomb electrodes were also measured with applying repeated 30~50 % strains.

S-2. SEM images of Ti and Pt coated honeycomb electrodes

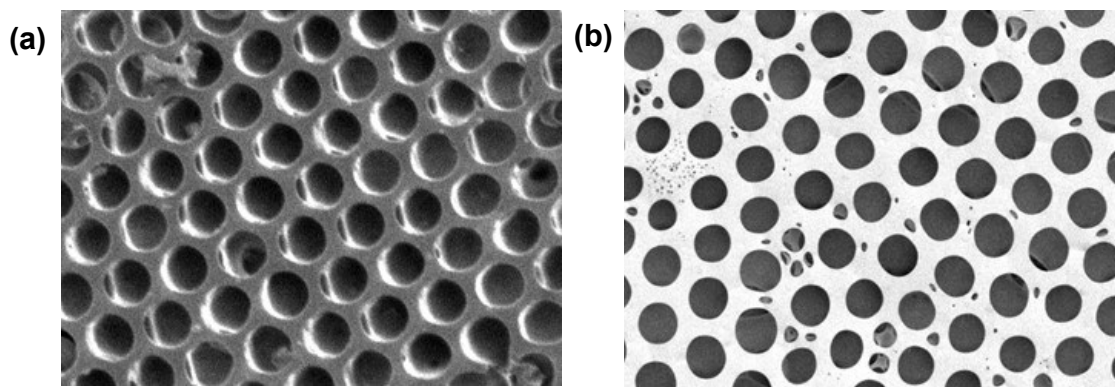


Figure S-2. SEM images of honeycomb electrodes coated with Ti (a) and Pt (b), respectively.

S-3. Sputtering rate of Au thin films

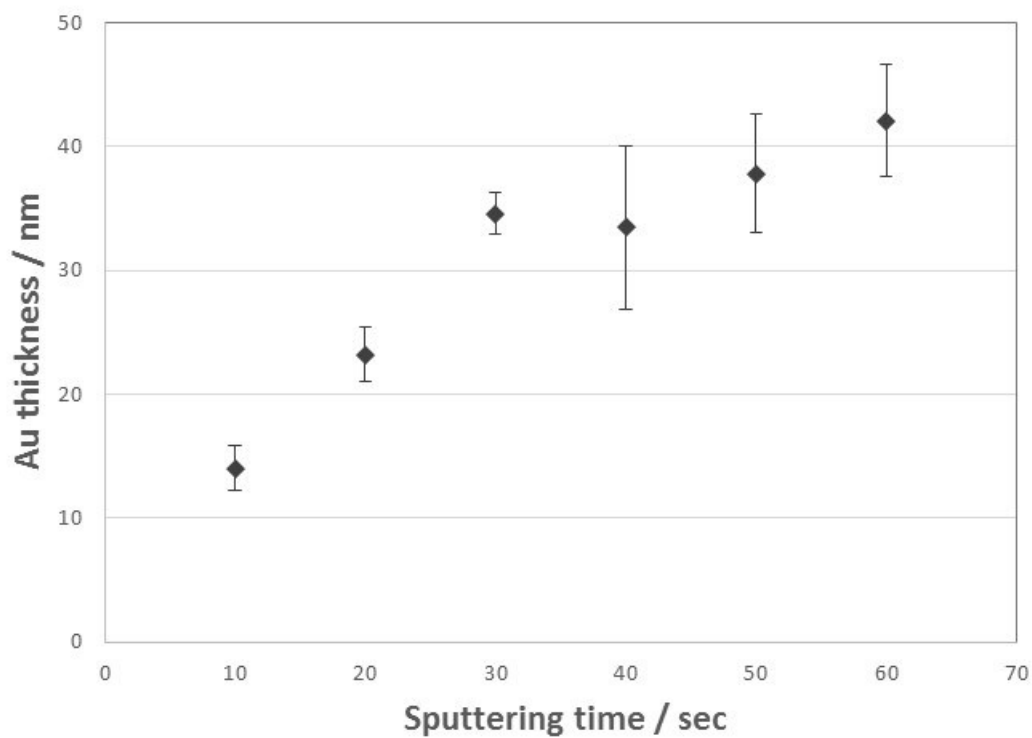


Figure S-3. Relation between sputtering time and Au thicknesses.

S-4. EDX spectrum and mapping images of cross-sectional honeycomb electrodes

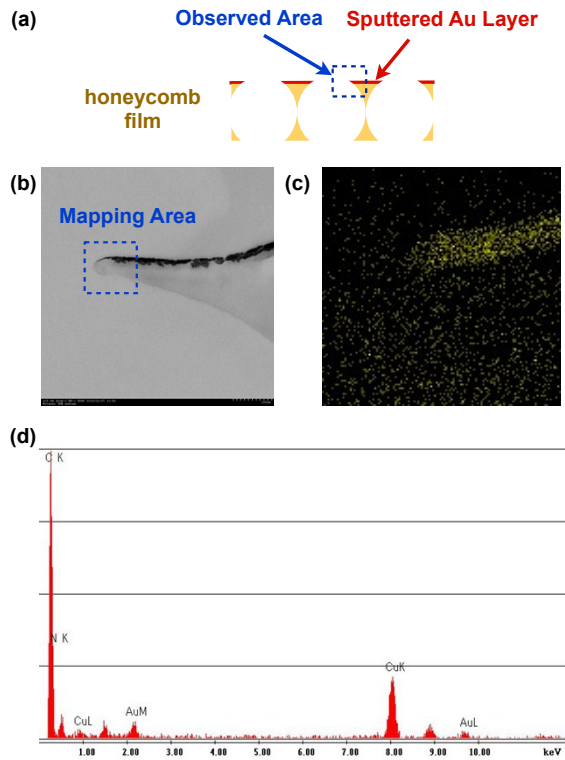
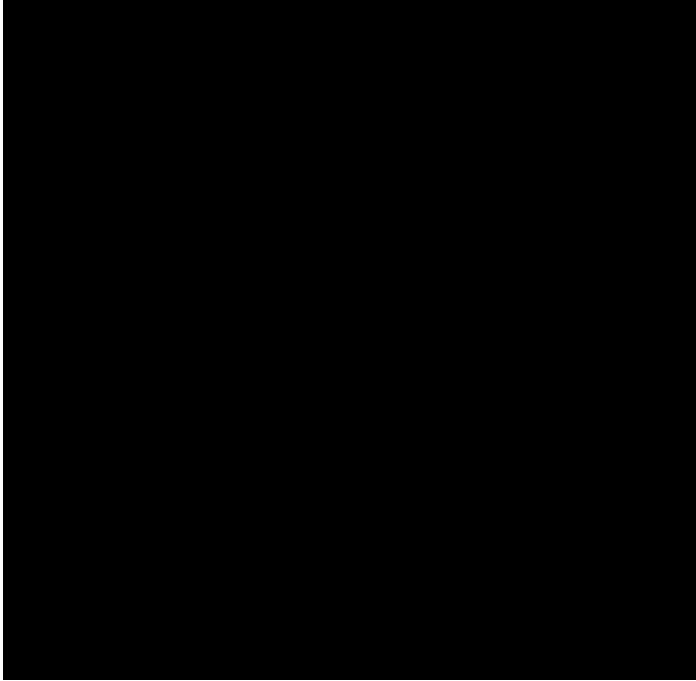


Figure S-4. Schematic illustration of cross-sectional model of honeycomb electrode (a), cross-sectional TEM image of honeycomb electrode (b), EDX mapping image of AuM signals (c) and EDX spectrum obtained from the same sample (d), respectively.

S-5. Stress-strain curve of Au sputtered PB honeycomb films



Experiments

Au was sputtered for 30 s onto a PB honeycomb film. Both end of a strip spacemen of the Au sputtered PB honeycomb was fixed on chucks (DP-20, IMADA, Toyohashi), and then the sample spacemen was stretched at its velocity of 10 mm/sec. The stress and strain curve was recorded automatically.

S-6. Cross-sectional TEM images of Au thin films

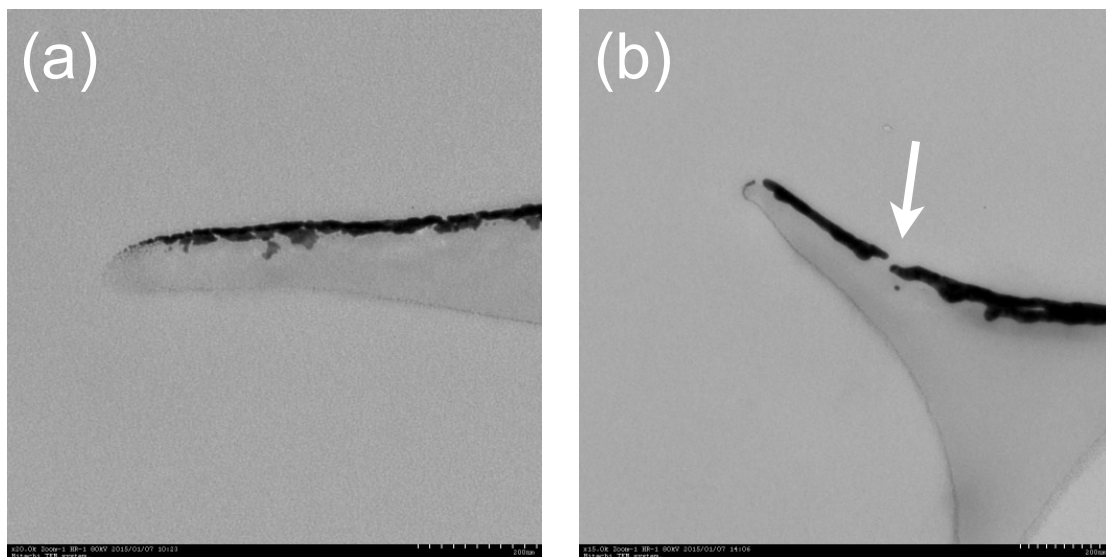


Figure S-5. Cross-sectional TEM images of honeycomb electrodes prepared by 20 sec sputtering (a) and 40 sec sputtering (b), respectively. A clack of Au thin film was observed in the case of 40 sec sputtering sample (white arrow).