Supplementary Information

Surface plasmon-enhanced activity and stability for methanol oxidation on gold caviar-like assembly under solar light

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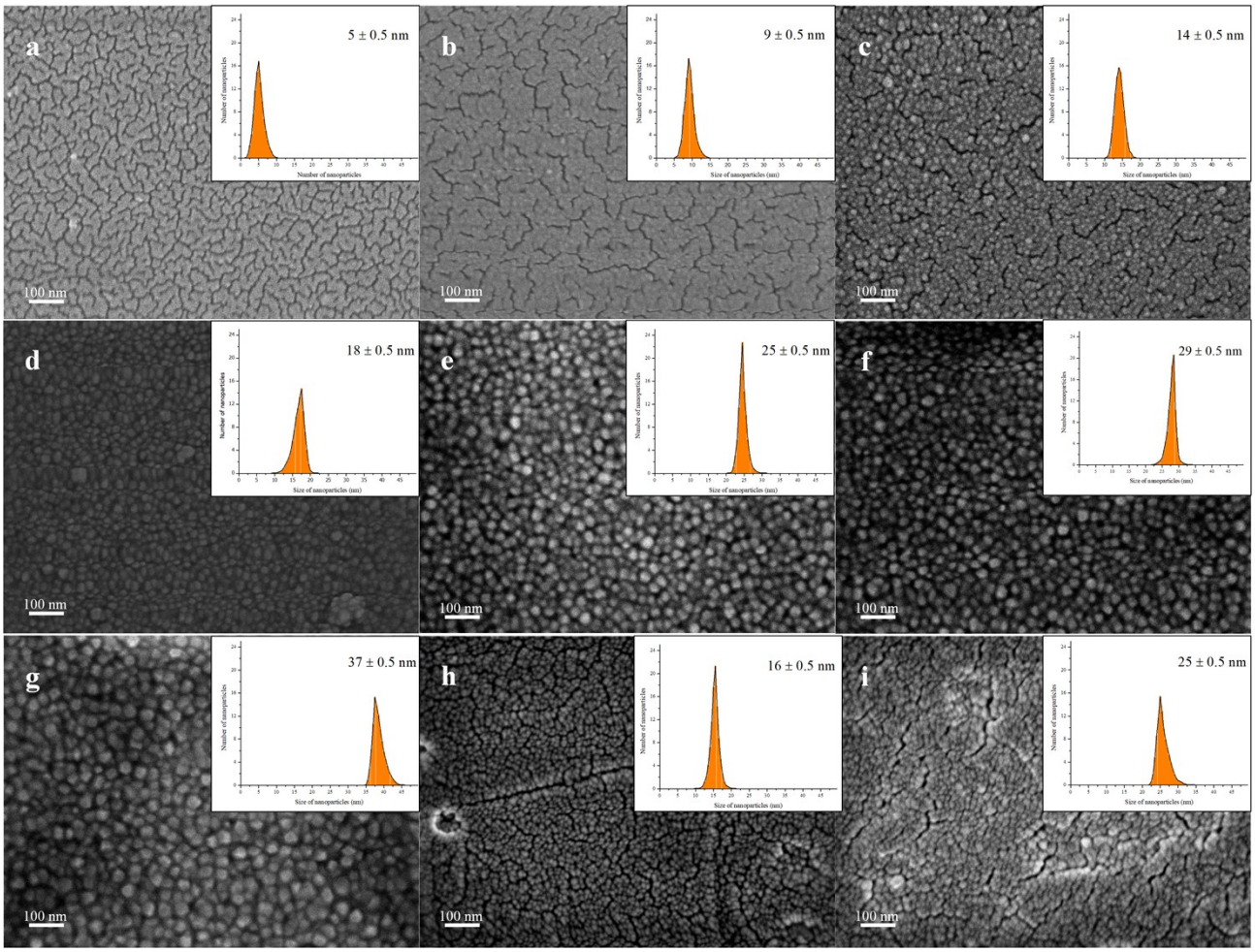

Figure S1 Morphology characterisation of gold caviar-like assembly (Au-CA). SEM images of Au-CA under the following deposition times: (a) 1T, (b) 2T, (c) 3T, (d) 4T, (e) 5T, (f) 6T, (g) 8T, (h) 10T and (i) 12T. The insets indicate the corresponding size distributions obtained using the Digital Micrograph analysis software from SEM images.

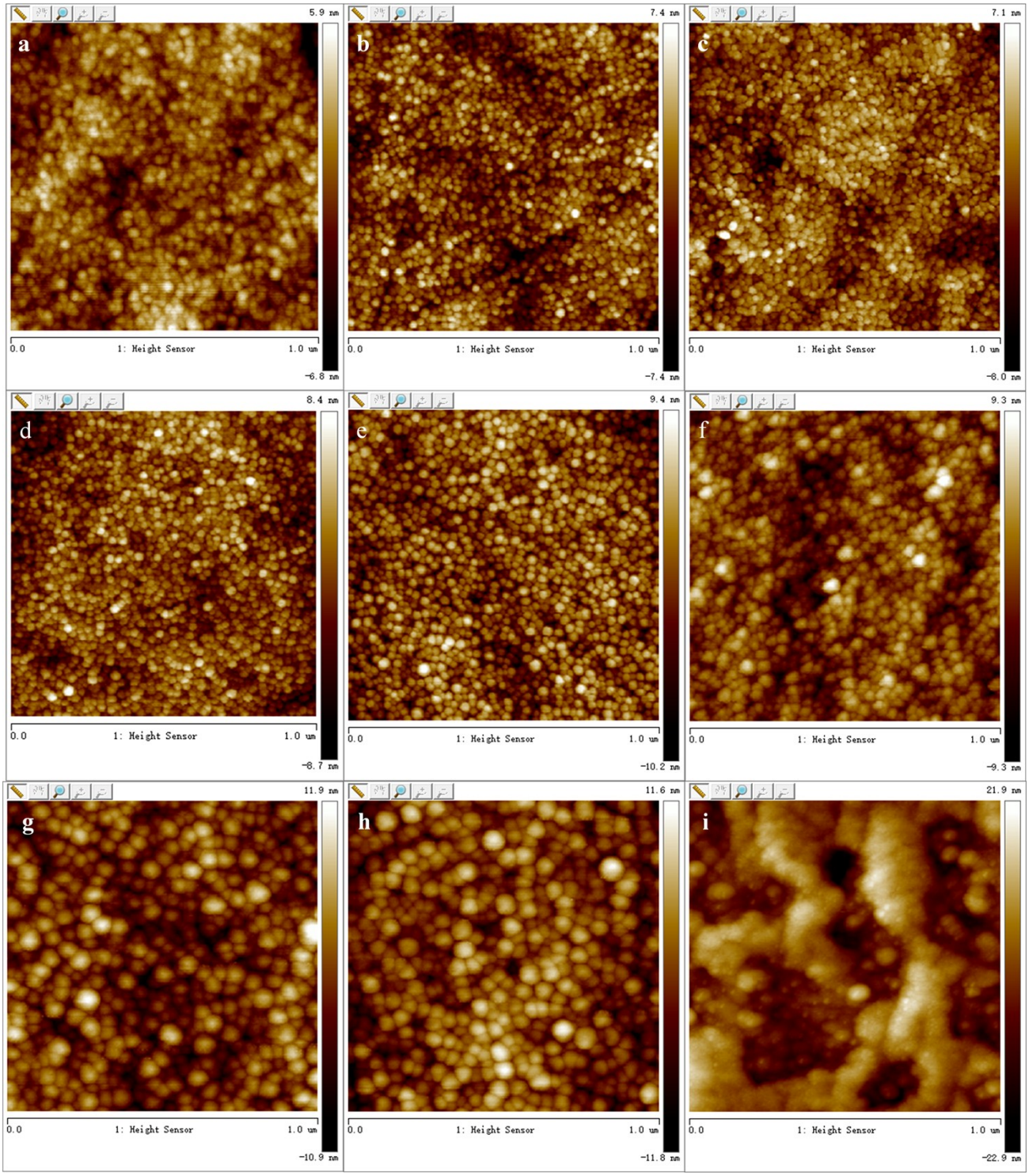

Figure S2 Morphology characterisation of Au-CA. Tapping-mode AFM images of Au-CA under the following deposition times: (a) 1T, (b) 2T, (c) 3T, (d) 4T, (e) 5T, (f) 6T, (g) 8T, (h) 10T and (i) 12T.

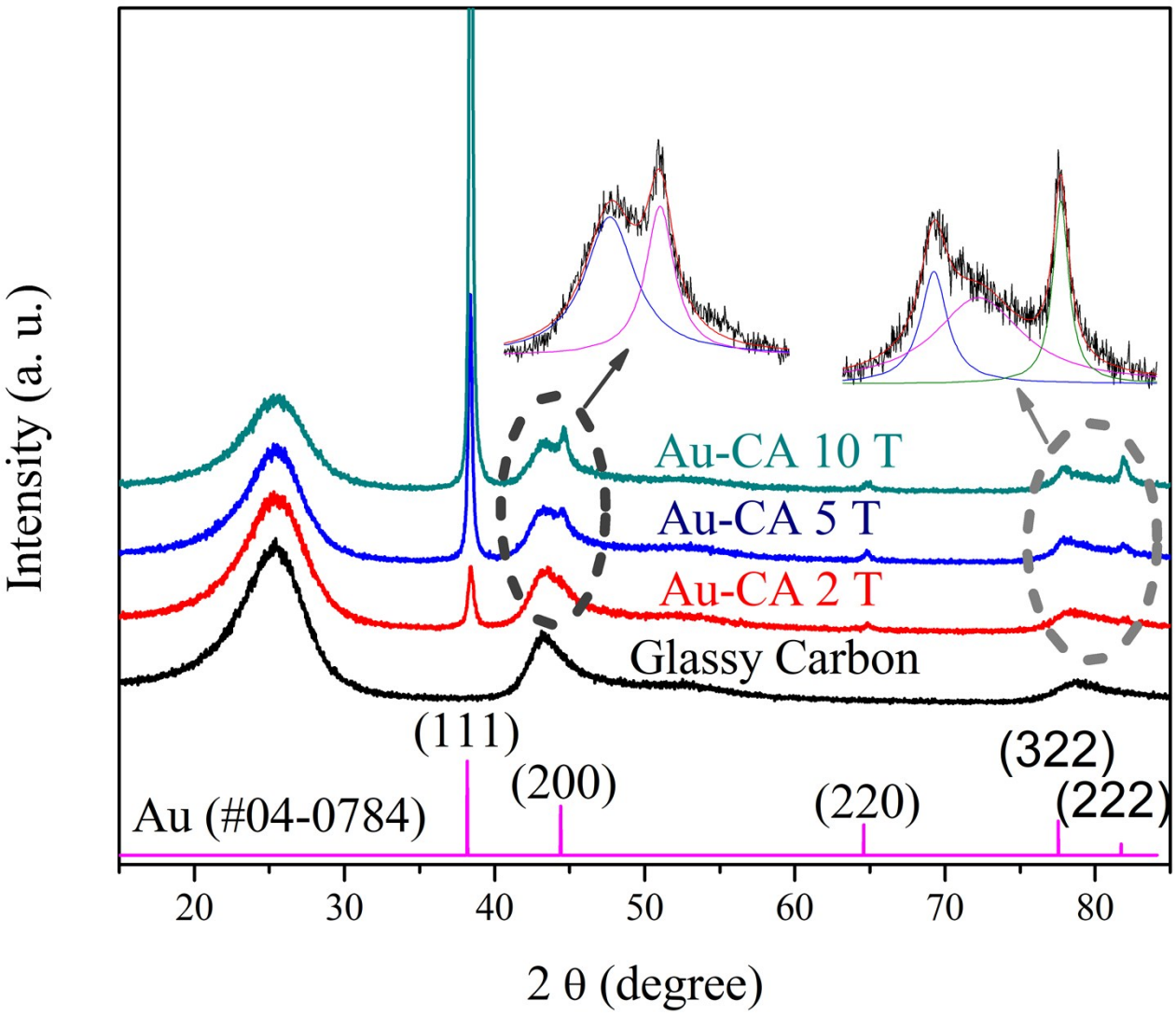

Figure S3 XRD patterns for the Au-CA and glass carbon. XRD patterns of Au-CA 2T, Au-CA 5T and Au-CA 10T compared with that of glass carbon. The insets indicate the details of the corresponding diffraction peaks. Bar diagram: Au #04-0784.

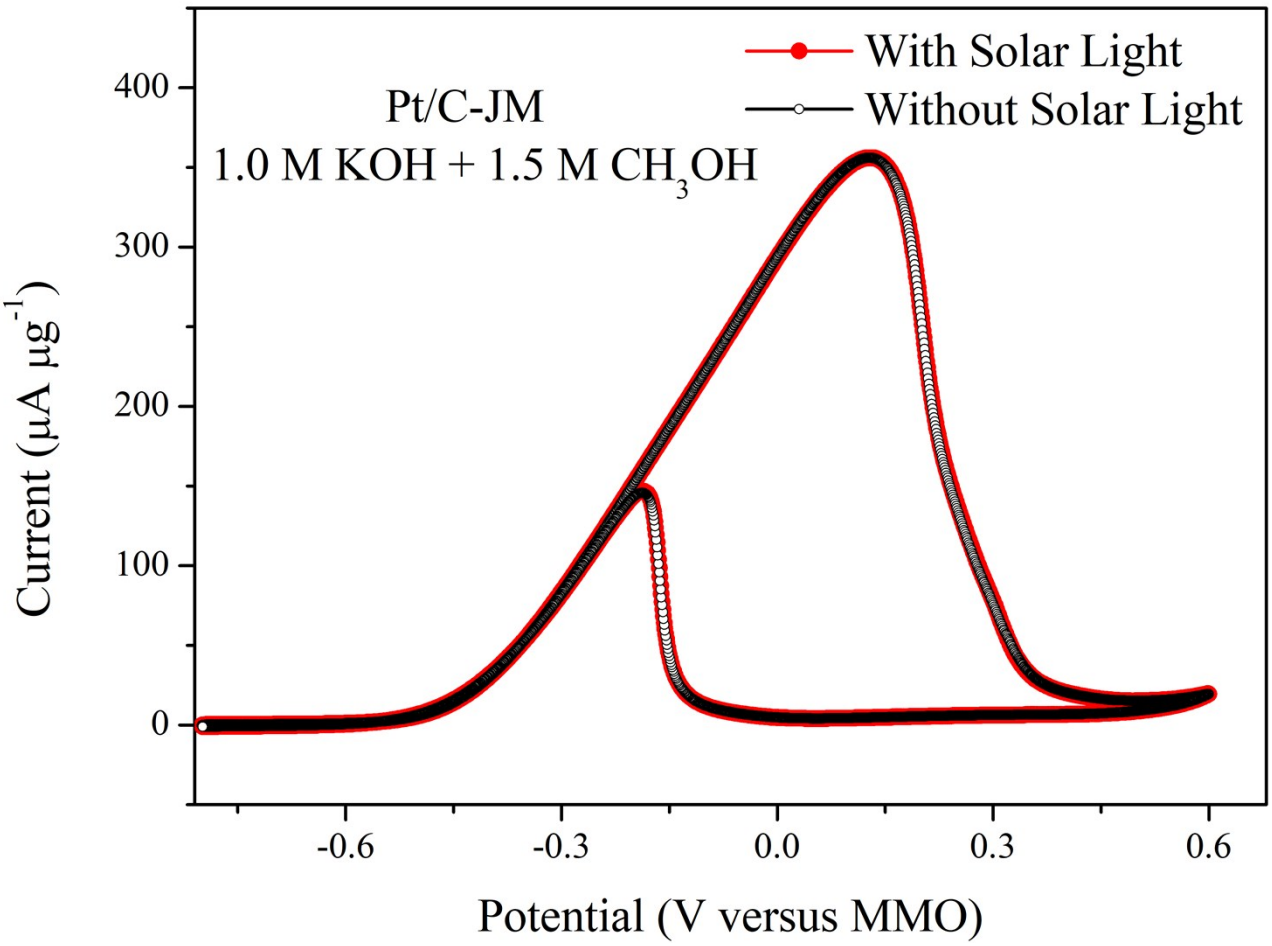

Figure S4 Effect of simulated solar irradiation on the methanol electrooxidation performance of commercial Pt/C catalyst in a deoxygenated solution of 1.0 M KOH mixed with 1.5 M CH_3OH.

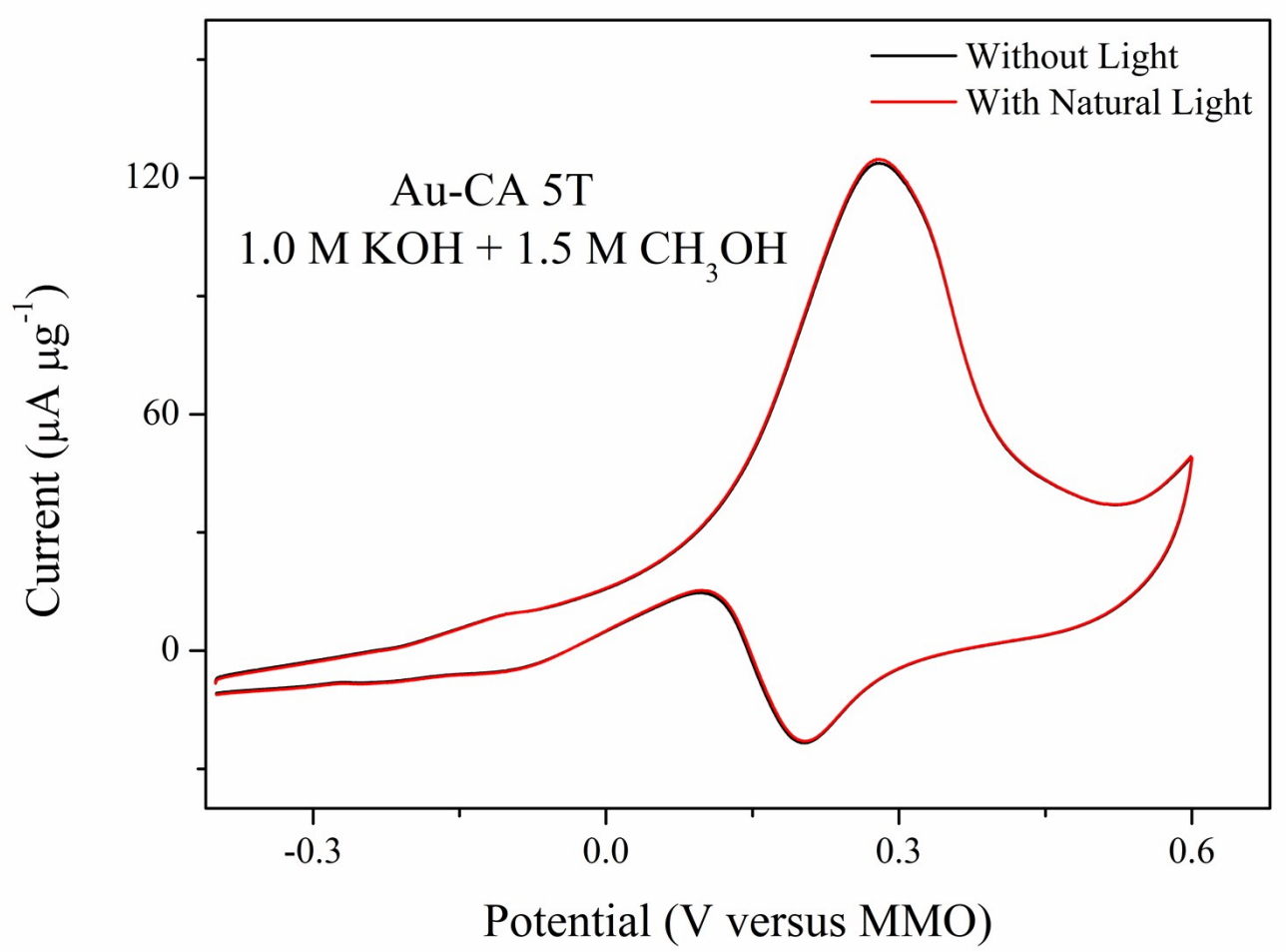

Figure S5 Effect of the natural light on the methanol electrooxidation performance of Au-CA 5T in a deoxygenated solution of 1.0 M KOH mixed with 1.5 M CH_3OH.

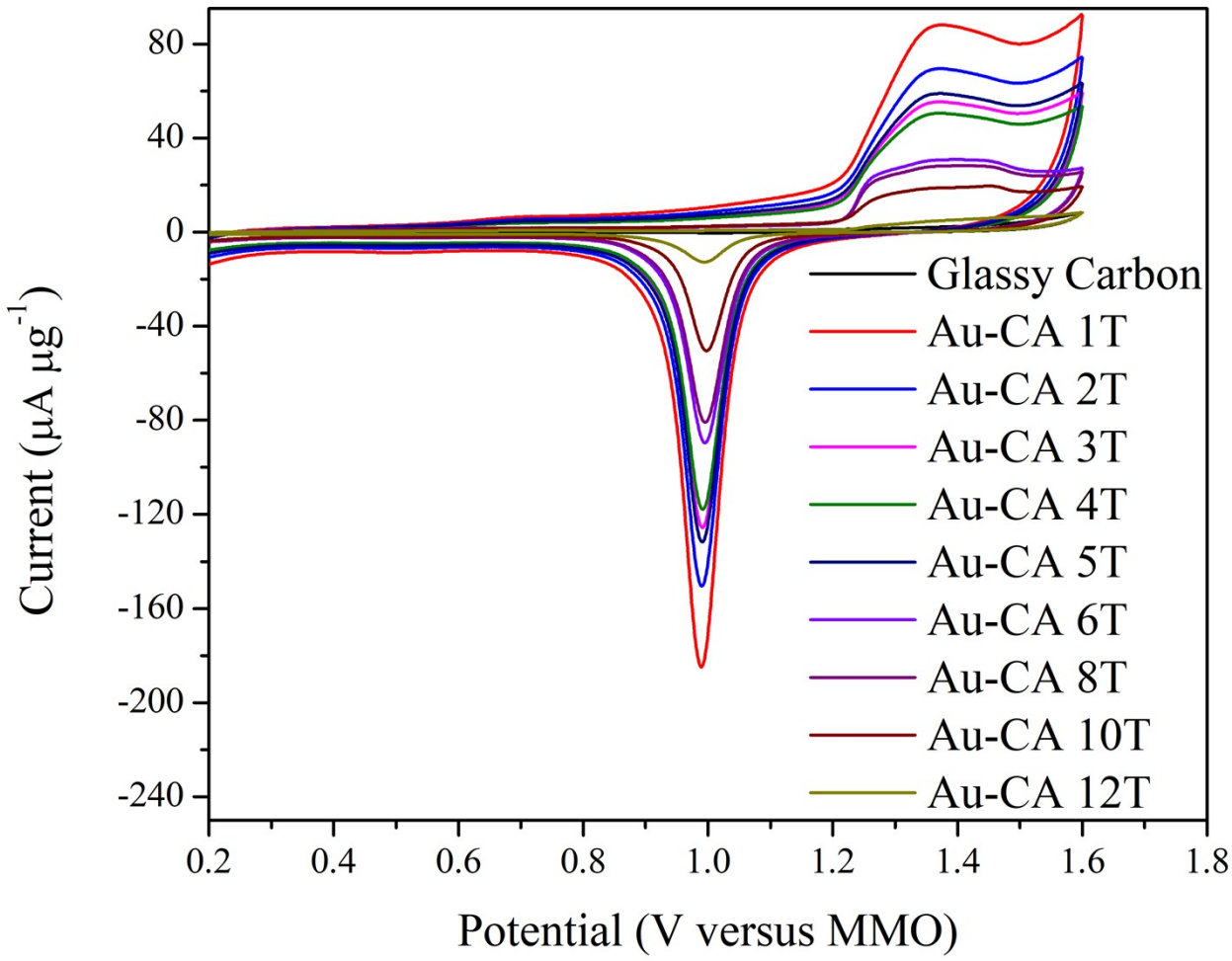

Figure S6 ECSA characterization. CV curves for glassy carbon and Au-CA under the following deposition times (1T, 2T, 3T, 4T, 5T, 6T, 8T, 10T and 12T) are recorded in N_2-saturated 0.5 M H_2SO_4 solution with a sweep rate of 50 mV s^{-1} and the Hg/HgO electrode used as reference electrode.

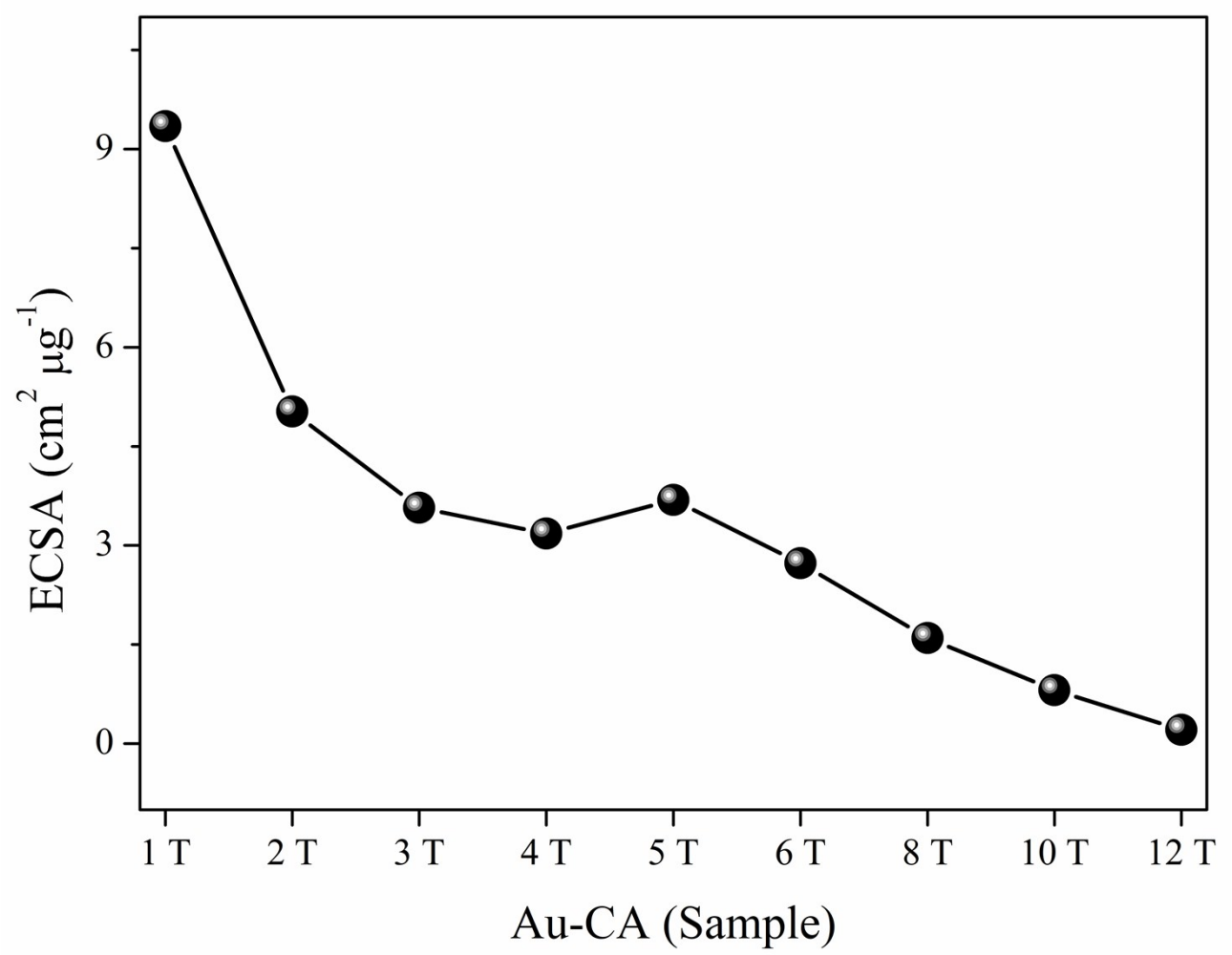

Figure S7 ECSA values of various Au-CA samples deposited for 1 to 12 times, which are calculated from corresponding CV curves from Figure S6.

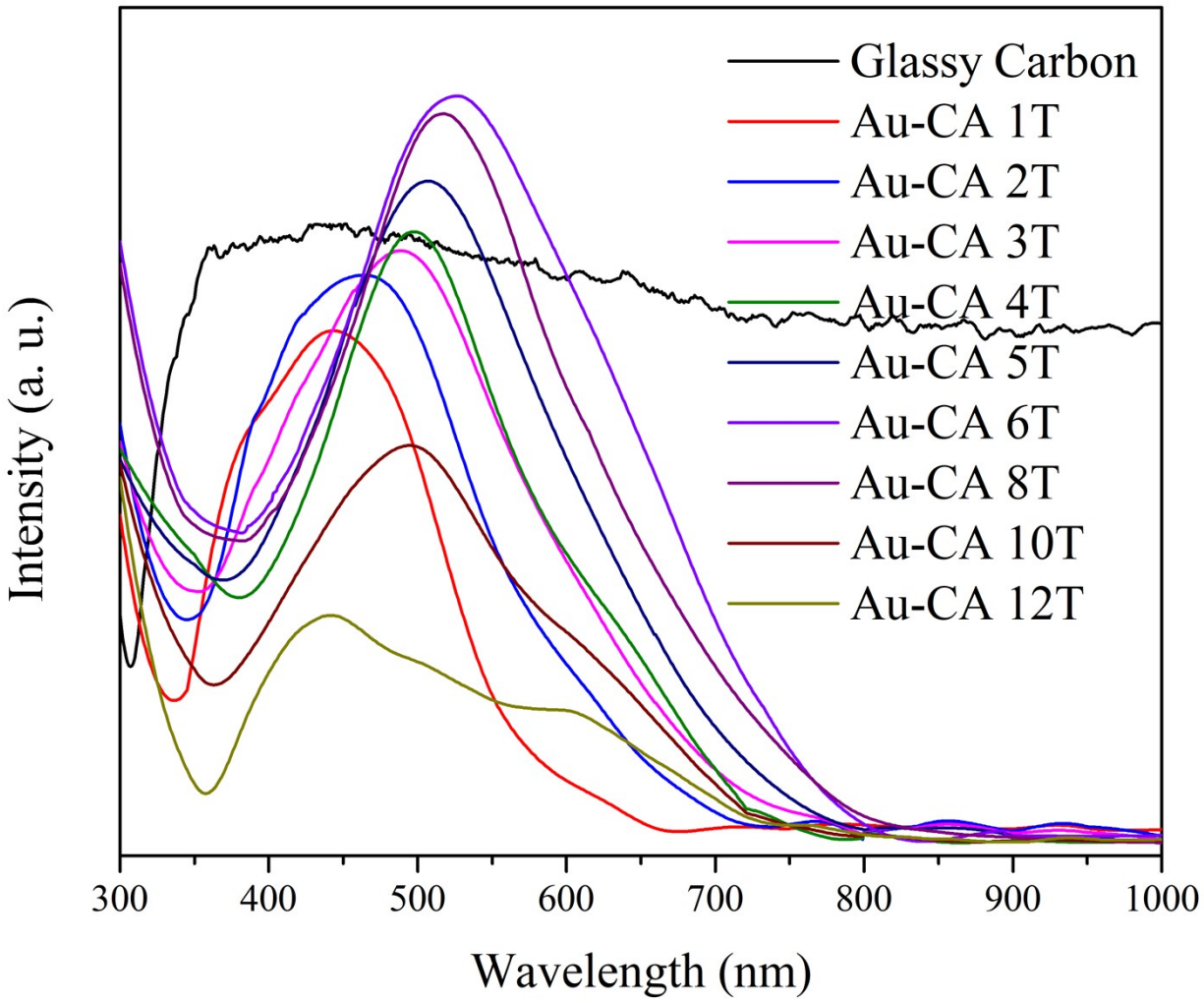

Figure S8 Diffuse reflectance UV–vis absorption for the Au-CA and glass carbon. Diffuse reflectance UV–vis absorption spectra of glass carbon and Au-CA with various deposition times (1T, 2T, 3T, 4T, 5T, 6T, 8T, 10T and 12 T.).

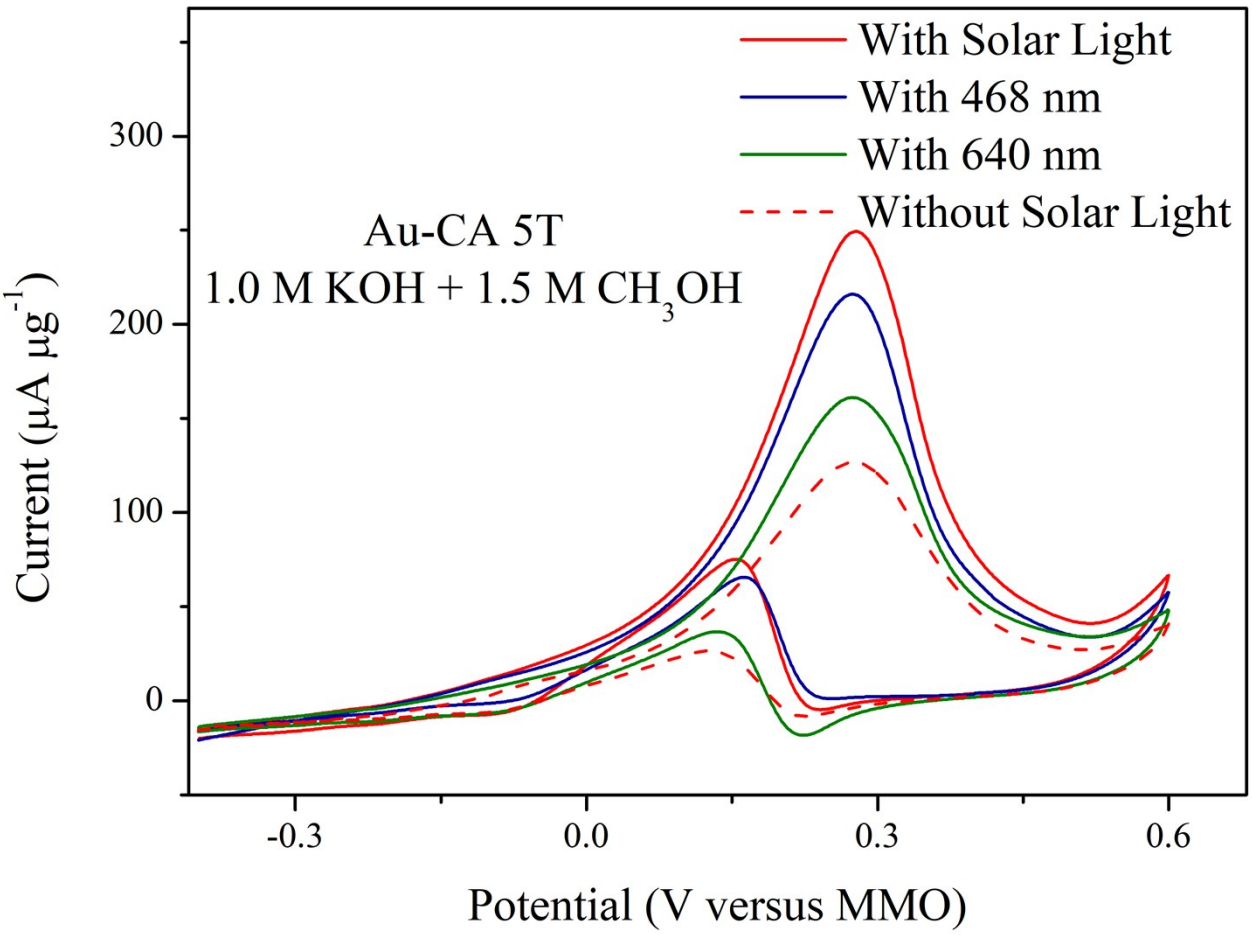

Figure S9 Effect of the various wavelength light (simulated solar light, LED: 468 nm and LED: 640 nm on the methanol electrooxidation performance of Au-CA 5T.

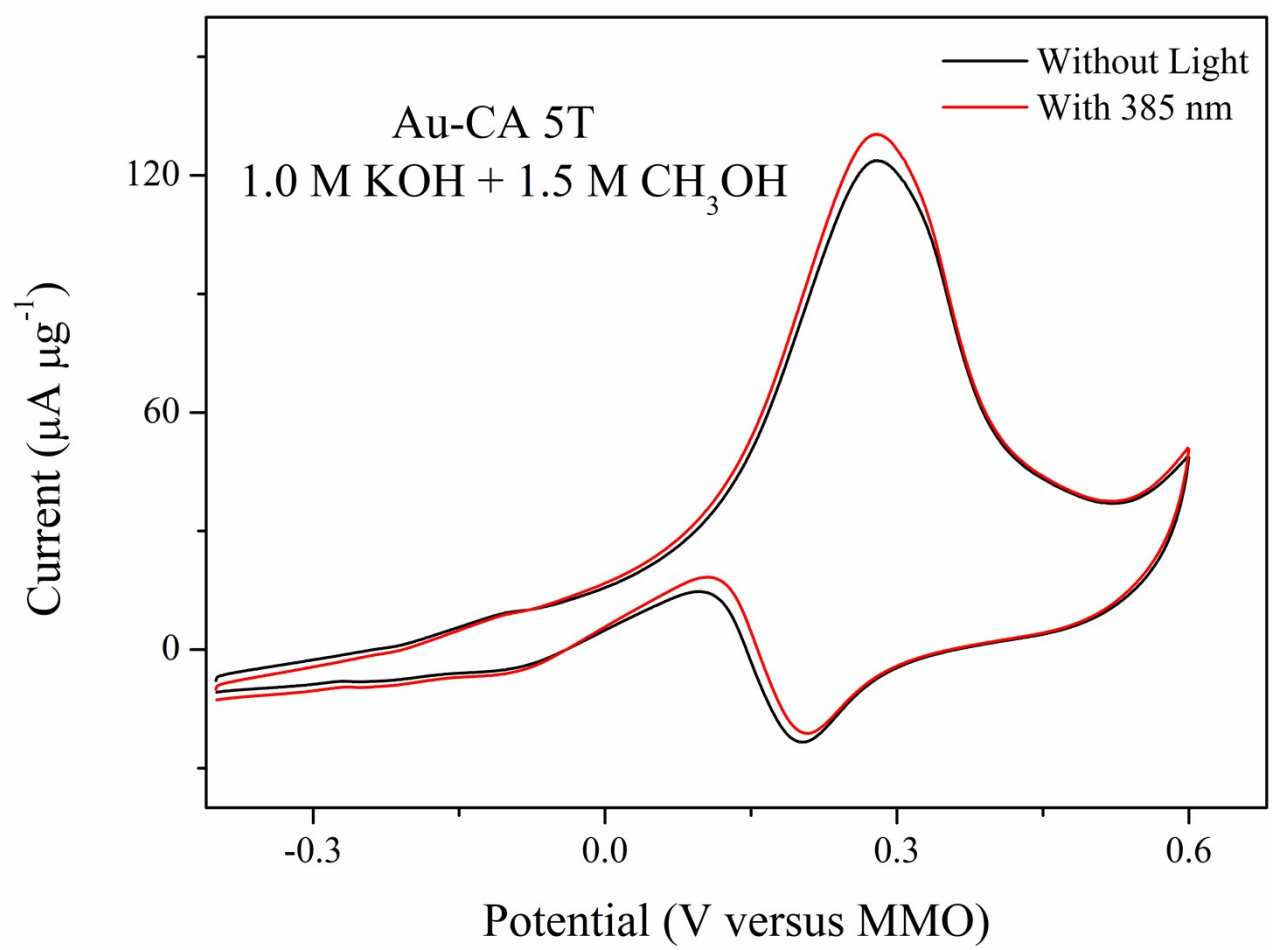

Figure S10 Effect of the UV light of 385 nm on the methanol electrooxidation performance of Au-CA 5T in a deoxygenated solution of 1.0 M KOH mixed with 1.5 M CH_3OH.

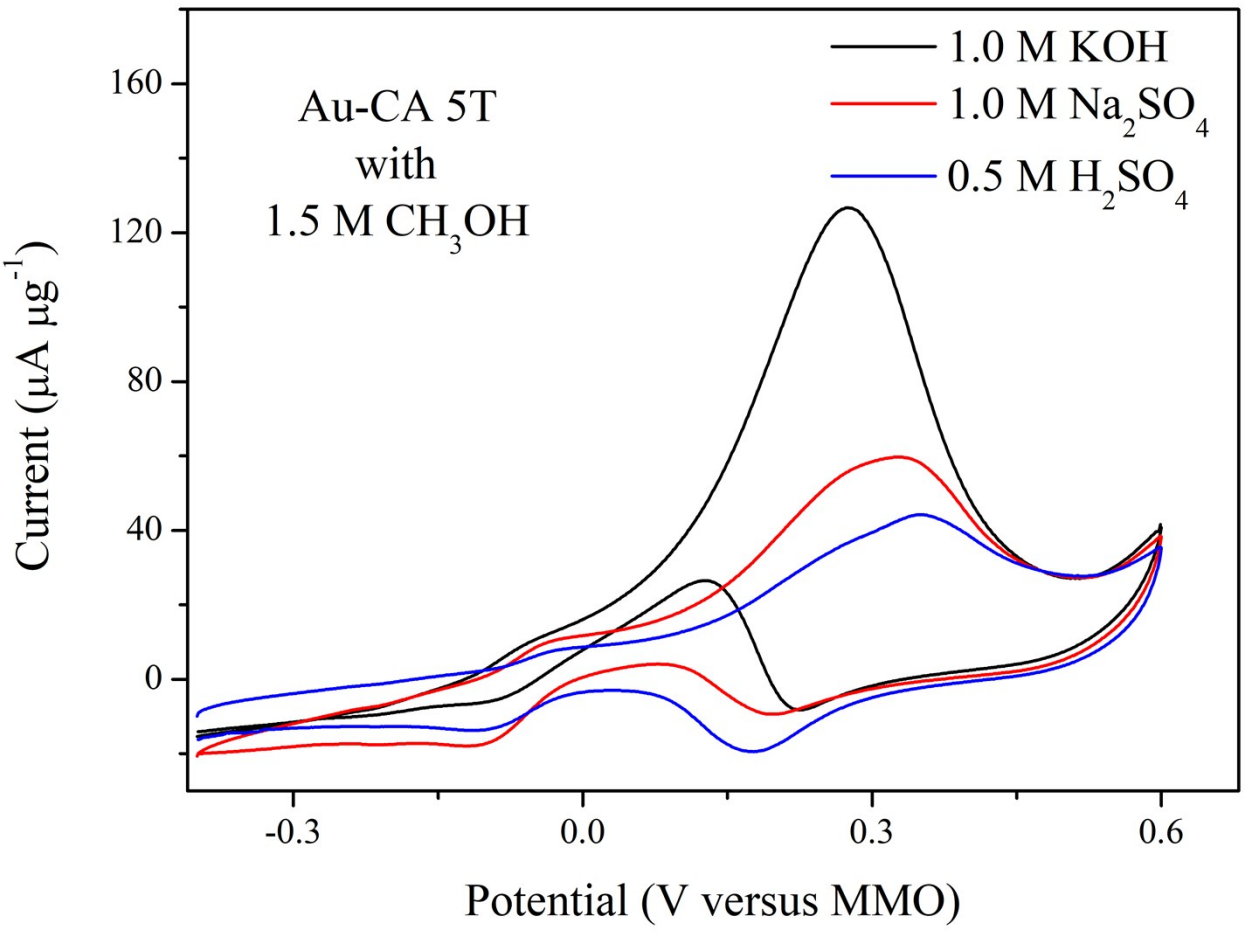

Figure S11 Effect of the pH value on the methanol electrooxidation capacities of Au-CA 5T in the deoxygenated solutions of 1.0 M KOH, 1.0 M Na_2SO_4 and 0.5 M H_2SO_4 mixed with 1.5 M CH_3OH, respectively.

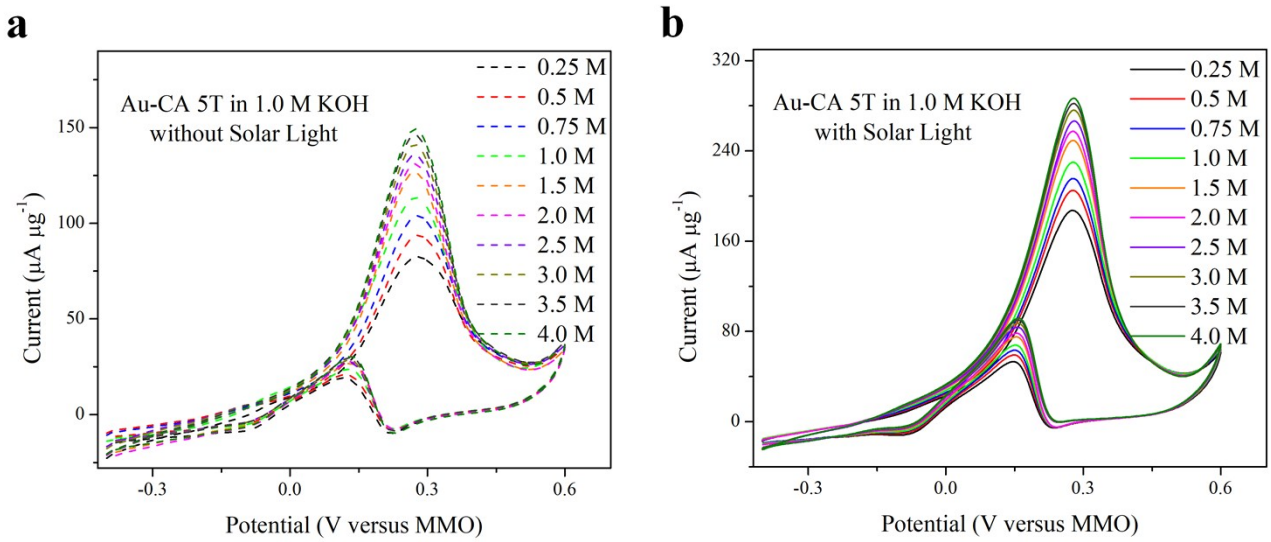

Figure S12 Effect of simulated solar irradiation on the methanol electrooxidation reaction of Au-CA 5T in deoxygenated solution of 1.0 M KOH with different methanol concentrations. CV curves of Au-CA 5T measured in the absence (a) and presence (b) of simulated solar irradiation in a deoxygenated solution of 1.0 M KOH with different methanol concentrations (0.25, 0.5, 0.75, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5 and 4.0 M).

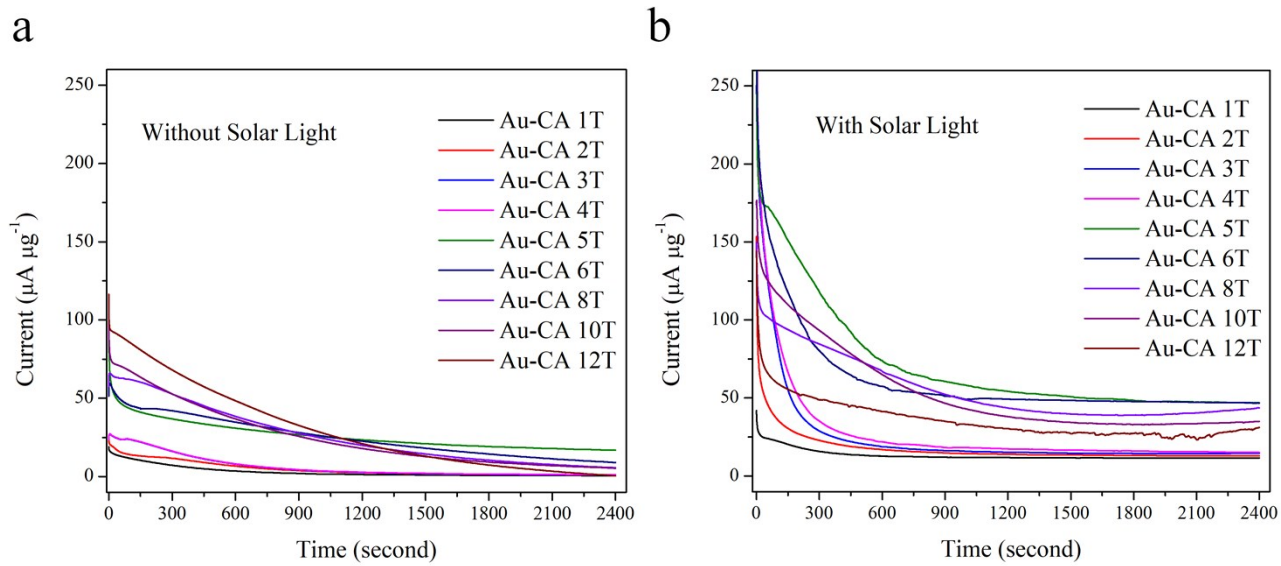

Figure S13 Solar light effect on the long-term electrooxidation performance of Au-CA under various deposition times. Chronoamperograms of Au-CA under various deposition times (1T, 2T, 3T, 4T, 5T, 6T, 8T, 10T and 12T) in a deoxygenated solution of 1.0 M KOH and 1.5 M CH_3OH at their oxidation potentials for 40 min in the absence (a) and presence (b) of simulated solar irradiation.

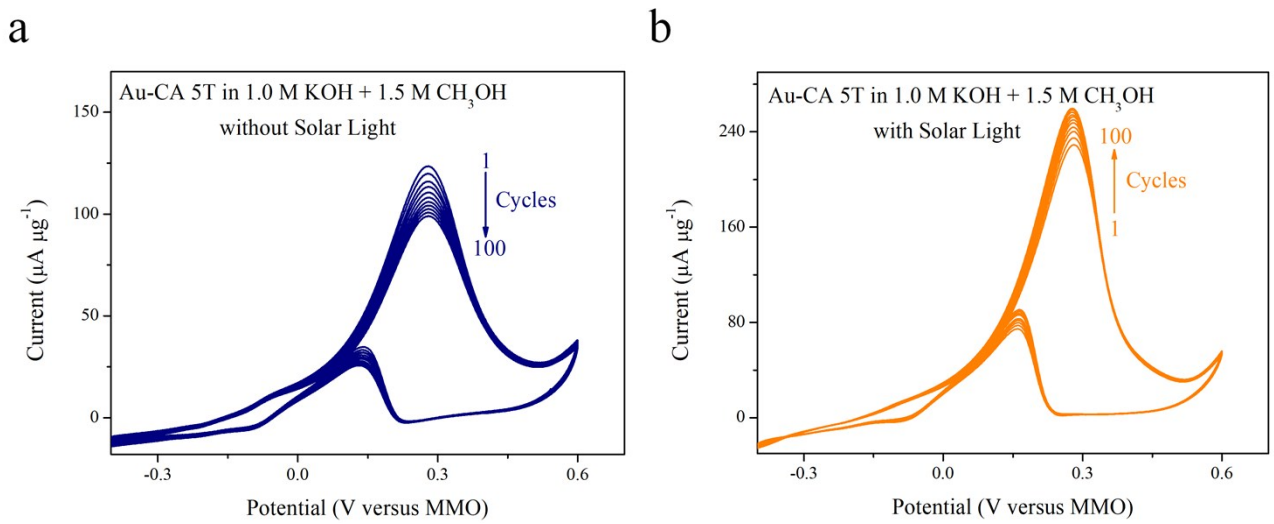

Figure S14 Effect of simulated solar irradiation on the stability of Au-CA 5T for methanol electrooxidation. CV curves of methanol electrooxidation reaction on Au-CA 5T in the absence (a) and presence (b) of simulated solar irradiation in a deoxygenated solution of 1.0 M KOH and 1.5 M CH_3OH.