

Fabrication of Gold Nanoparticles Embedded Laser-Induced Graphene (LIG) Electrode for Hydrogen Evolution Reaction

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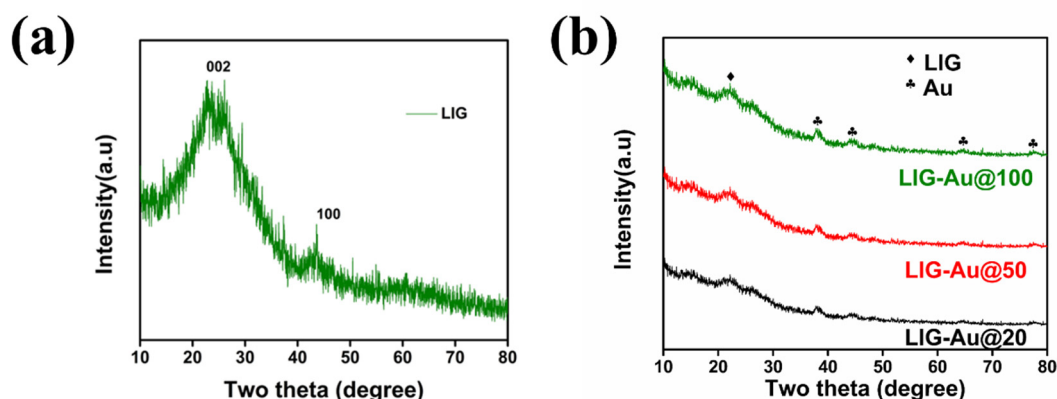


Figure S1 (a)&(b) shows the XRD pattern of bare LIG and as-prepared LIG-Au hybrids respectively.

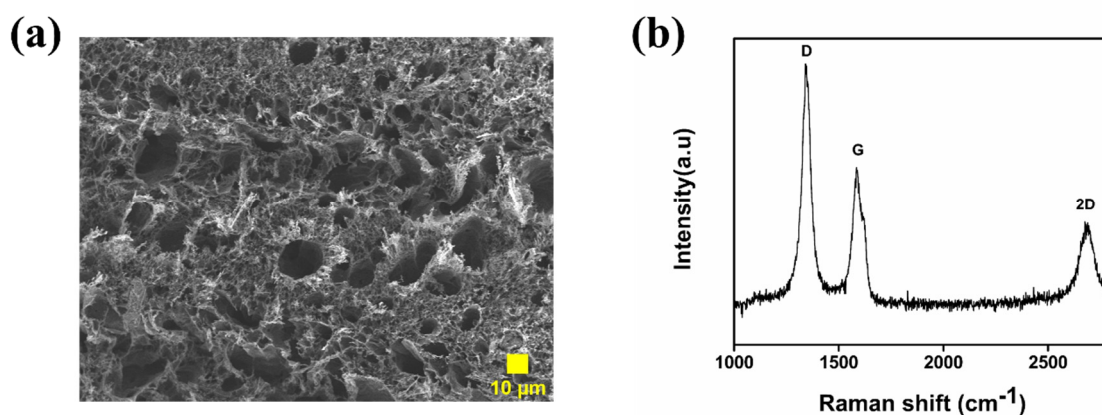


Figure S2 (a) represents FESEM of bare LIG (b) Raman spectra depicting D, G and 2D peaks of LIG.

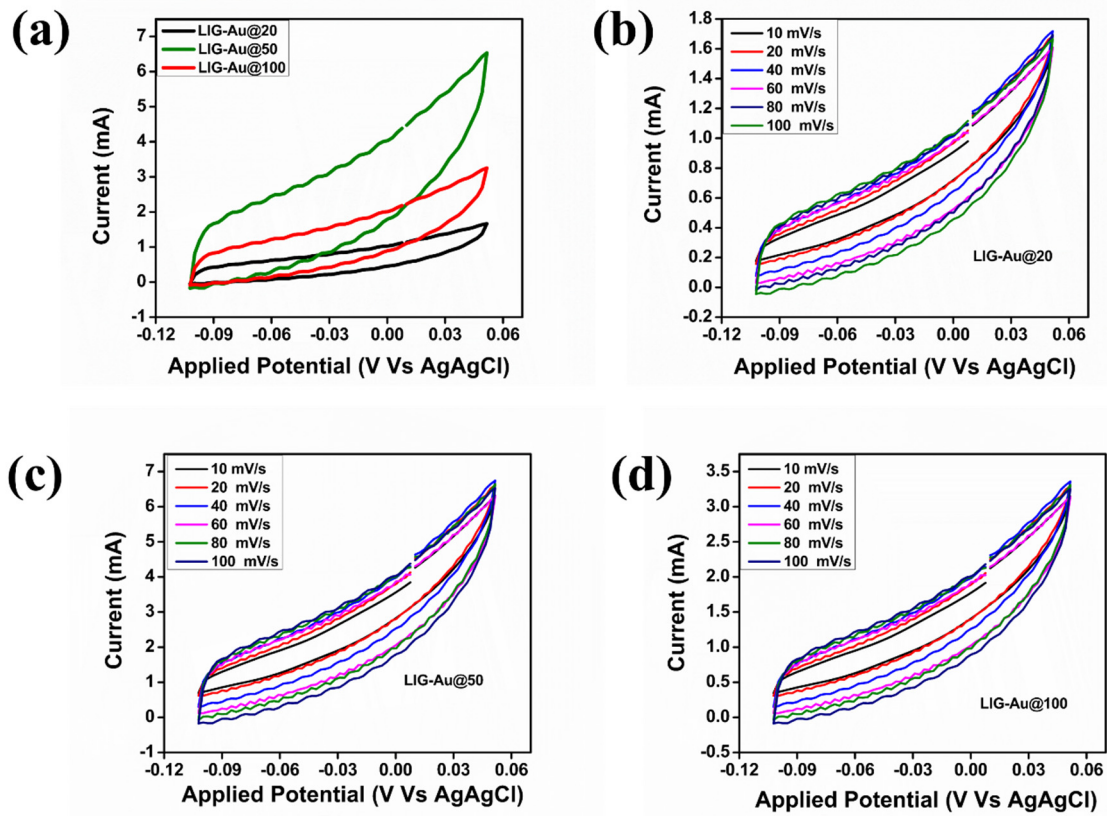


Figure S3 (a) shows the CV scan in the non-faradic region to calculate the double layer capacitance in 0.5M H_2SO_4 solution. (b-d) represents the individual CV scans in the same regions for all LIG-Au nanostructures.

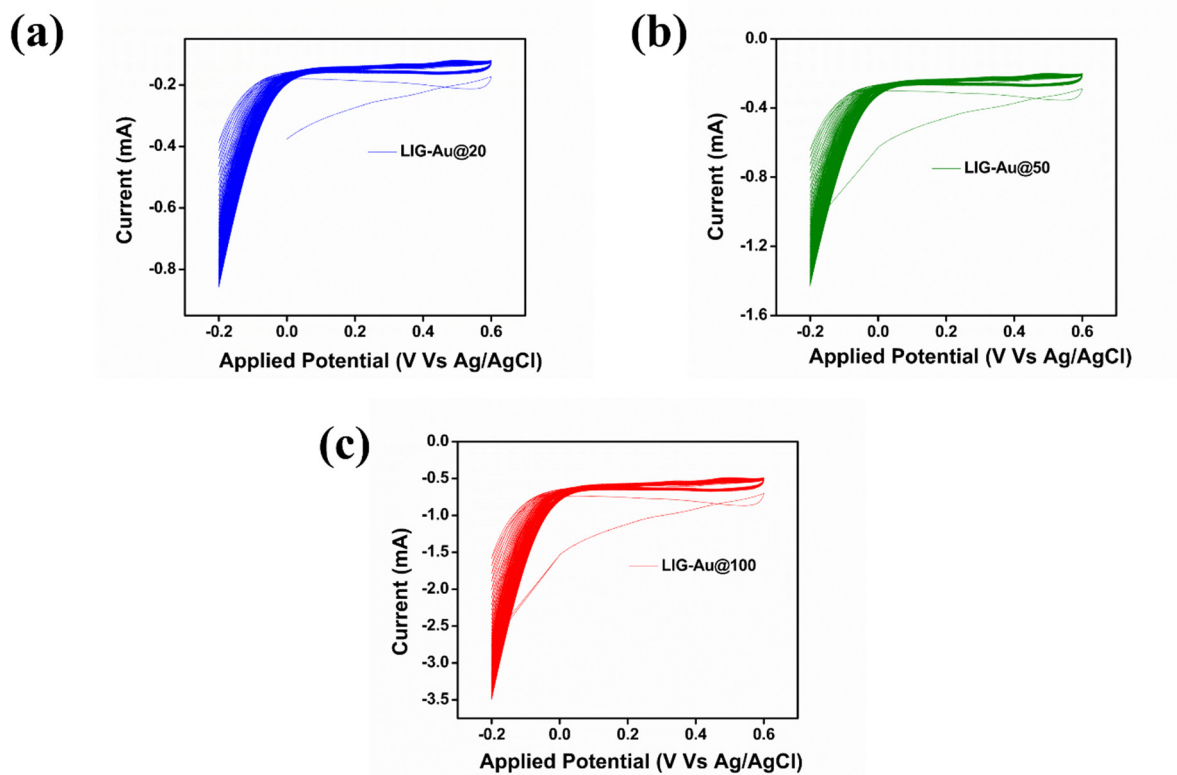


Figure S4 represents the CV scans of bare LIG in HAuCl_4 and H_2SO_4 solution during the electrodeposition process at different cycles.

Dry weight measurements to calculate the exact amount of gold content.

Weight of bare LIG = 20.5mg

Weight of bare LIG-Au@20 = 21.7 mg

Weight of bare LIG-Au@50 = 22.8 mg

Weight of LIG-Au@100 = 24.6 mg

The exact weights of LIG-Au@20,50 & 100 are 1.2 mg, 2.3 mg, and 4.1 mg respectively which is approximately consistent with the loading cycles ratio.

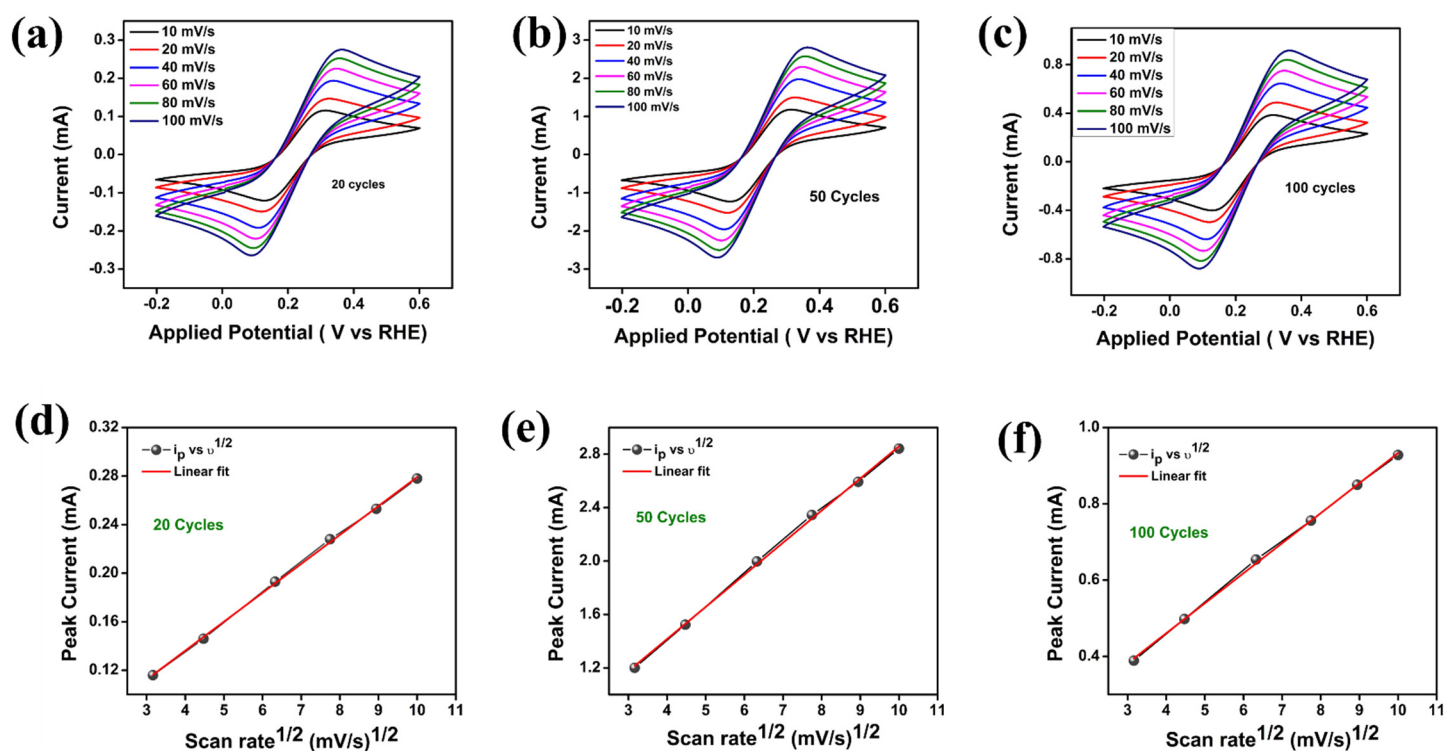


Figure S5 Cyclic Voltammetry studies of LIG-Au nanostructures in the presence of 5mM Ferro/Ferricyanide + 0.1M KCl.

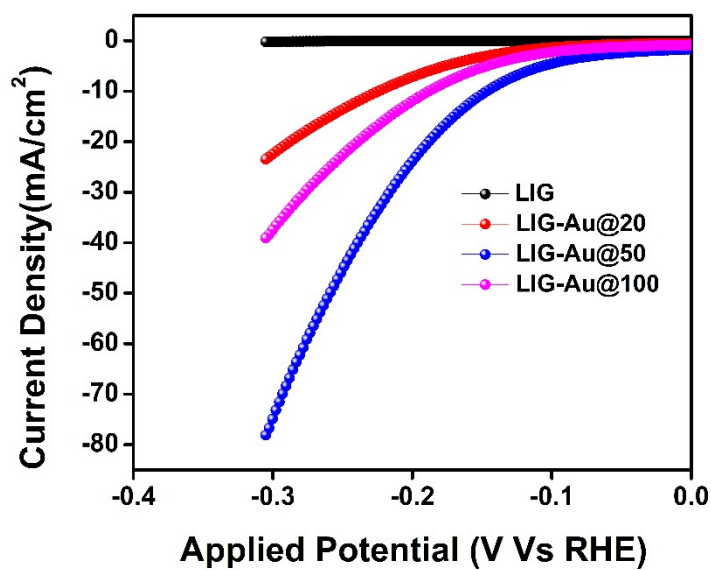


Figure S6 LSV scans at 2 mV/s.

Table S1 shows the TOF values for comparison of **LIG-Au@50** with other similar catalysis.

Catalysis	TOF (s⁻¹)	Reference
SnCl ₂	0.0048	[1]
ZnCl ₂	0.0028	[1]
Au ₃ Ag ₁	5.4 × (10 ⁻¹³)	[2]
Au ₂ Ag ₁	5.6 × (10 ⁻¹³)	[2]
Au	4.4 × (10 ⁻¹³)	[2]
LIG-Au@50	0.0091	This work

References:

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2. Masoud, N.; Delannoy, L.; Calers, C.; Gallet, J.J.; Bournel, F.; de Jong, K.P.; Louis, C.; de Jongh, P.E. Silica-Supported Au–Ag Catalysts for the Selective Hydrogenation of Butadiene. *ChemCatChem* **2017**, *9*, 2418–2425, doi:10.1002/cctc.201700127.