

## Monolithic Laser Scribed Graphene Scaffold with Atomic Layer Deposited Platinum for Hydrogen Evolution Reaction

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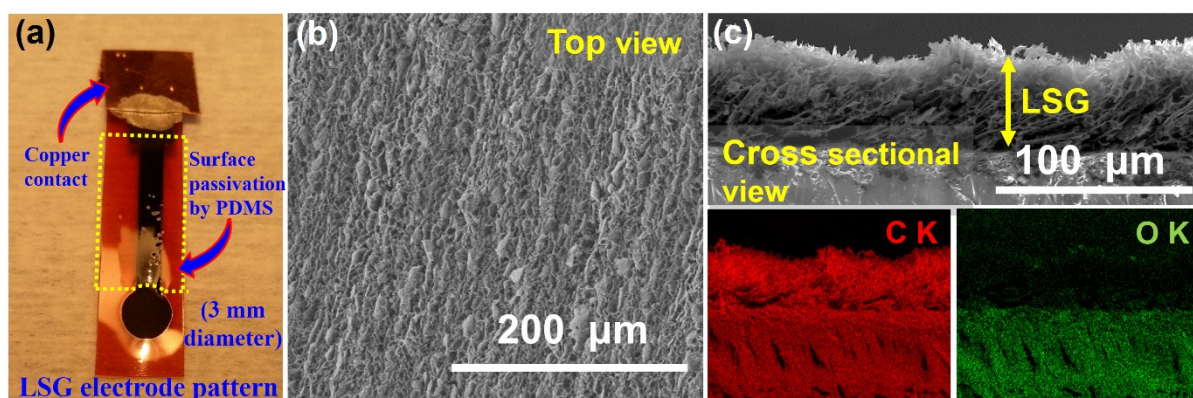
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### Electronic Supplementary Information (ESI)

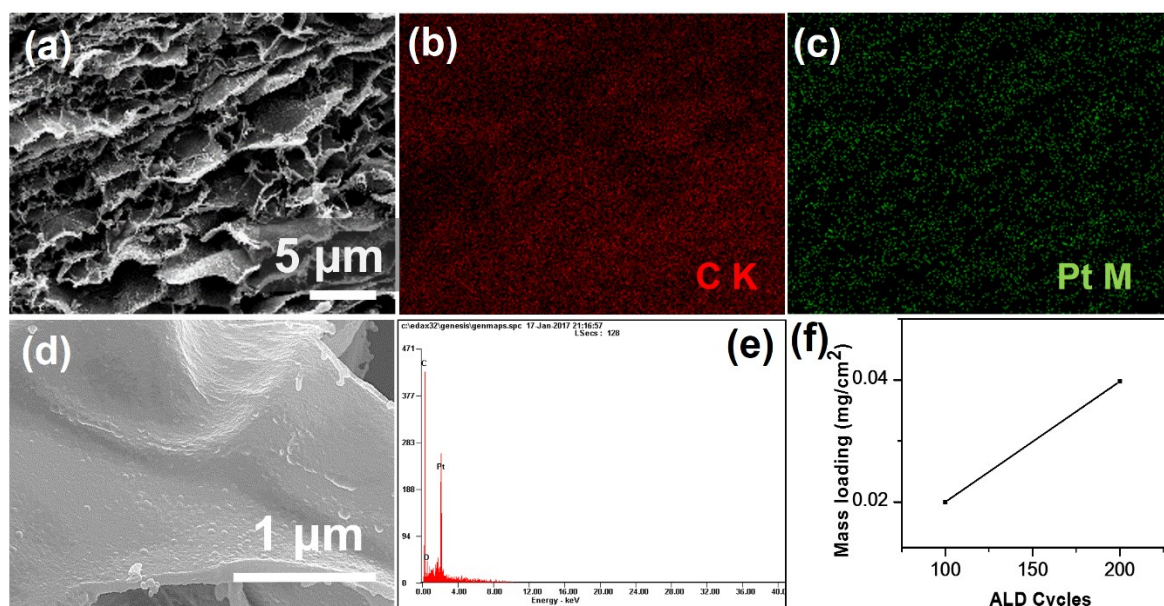


**Fig. S1** (a) Digital photograph of a fully assembled LSG HER electrode scaffold, (b) Top-view SEM micrograph of LSG showing rich in edge plane sites, (c) Cross-sectional view of electrode showing its 3D porous nature and corresponding EDAX maps for C and O elements are shown.

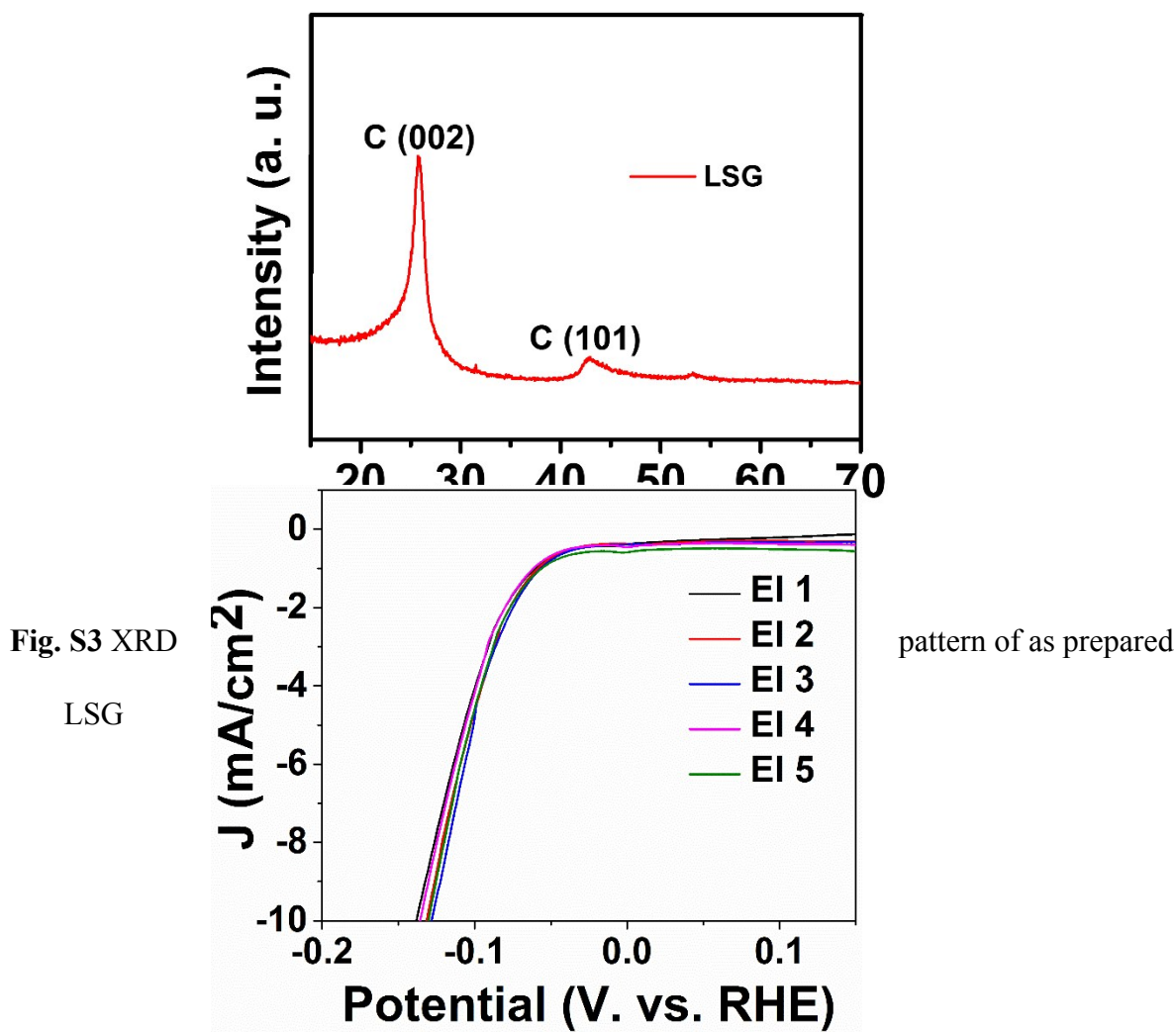
### Preparation of Pt/C@GCE

For preparing Pt/C electrode, about 10 mg of commercial Pt/C catalysts were mixed with 0.5 ml of 0.5% Nafion solution. About 10  $\mu$ L aliquot of the dispersion was drop-casted on 3 mm

dia glassy carbon electrode and allowed it to dry under ambient conditions. Prior to use, the Pt/C modified GCE was rinsed in DI water in order to remove the un-attached Pt/C.



**Fig. S2** (a) Top-view SEM micrograph of Pt/LSG<sub>200</sub> electrode showing it is rich in edge plane sites and having ALD Pt on surface, (b) corresponding elemental mapping of C K and (c) Pt M on Pt/LSG<sub>200</sub> surface, (d) high magnification SEM micrograph of Pt/LSG<sub>200</sub> showing surface coated Pt, (e) EDAX spectrum and (f) plot of mass loading of Pt on LSG after 100 and 200 ALD cycles.



**Fig. S3** XRD  
LSG

**Fig. S4** LSV showing HER onset region for five different Pt/LSG<sub>200</sub> electrodes at 5 mV/s scan rate in 0.5 M H<sub>2</sub>SO<sub>4</sub>.

Table S1. Raman spectra analysis of Pt/LSG.

S. No.	D band (position, FWHM) $\text{cm}^{-1}$	G band (position, FWHM) $\text{cm}^{-1}$	2D band (position, FWHM) $\text{cm}^{-1}$	$I_D/I_G$	$I_{2D}/I_G$
1	1362, 41.6	1582, 32.1	2722.3, 64.4	0.23	0.35
2	1361, 40.1	1579.5, 30.8	2720.1, 57.8	0.21	0.34
3	1361.2, 38.7	1579.6, 30.3	2720, 58.3	0.21	0.34
4	1362.2, 37.6	1581.1, 30	2722.6, 56.8	0.22	0.35
5	1361.7, 38.2	1580, 29.8	2721.2, 56.2	0.2	0.32

Table S2. Comparison of HER performance of LSG and Pt/LSG based electrodes.

Electrode	LSG	Pt/LSG <sub>20</sub>	Pt/LSG <sub>50</sub>	Pt/LSG <sub>100</sub>	Pt/LSG <sub>200</sub>	PtC
Onset potential (V) at $J = -10 \text{ mA/cm}^2$	-0.667	-0.188	-0.181	-0.164	-0.131	-0.118