

# Unravelling the photo-excited chlorophyll-a assisted deoxygenation of graphene oxide: Formation of nanohybrid for oxygen reduction

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## Uv-vis absorption spectra:

The principal absorption peaks of CHL-a (spectrum a) in the red at 665 nm, Q band, and at 433 nm in the blue, Soret band, are in agreement with those reported in the literature <sup>8</sup> and that Chla is present in monomeric form <sup>2</sup>, with increasing CHL-a conc. the absorbance increases linearly.

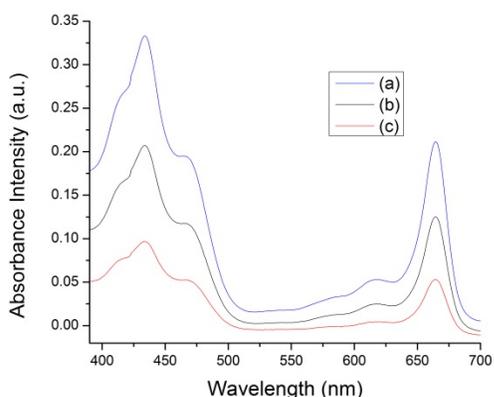


Fig. S1 Uv-Vis spectra of CHL-a with  $10^{-7}$ ,  $10^{-6}$ ,  $10^{-5}$  mole of concentration for (a),(b) & (c) respectively.

## Cyclic voltammetry measurement:

There is no significant peak of ORR at the catalytic activity of CHL-a with  $10^{-5}$  mole of concentration on the glassy carbon electrode without any presence of RGO Fig. S1. The anodic peak at +0.46v appears due to the reduction of carbonyl group attached with the macrocycle which accepts electron from electrode in negative run. The carbonyl reduction peak at -0.4v appears when chlorophyll c=O group accepts electron from electrolyte in positive run due to the conformational freedom of bare chlorophyll molecules over electrode surface. Therefore, it can be concluded that the ORR activity is only occurring in RGO/CHL-a nano-hybrid where the  $\pi$  stacked chlorophyll stabilized over graphene surface acquire a stacked and arranged conformation with lesser conformational heterogeneity, as evident from TCSPC data and cumulatively act as a reaction center to participate in ORR.

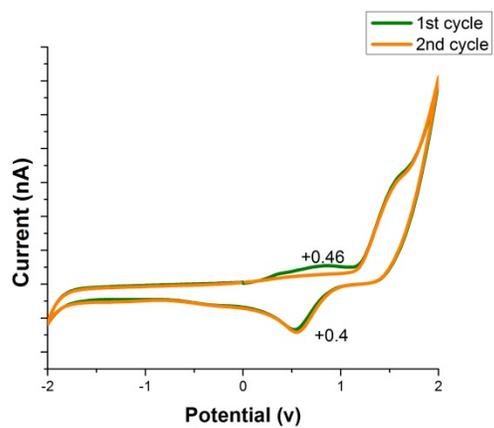


Fig. S2 Cyclic voltammety of CHL-a with  $10^{-5}$  mole of concentration on the glassy carbon electrode without any presence of RGO.

References:

1. C. E. Jones and R. A. Mackay, *J. Phys. Chem.*, 1978, **82**, 63–65.
2. A. J. Hoff and J. Amesz, in *Chlorophylls*, ed. H. Scheer, CRC Press, Boca Raton, FL, 1995, p. 726.