Graphene Oxide as a Mono Atomic Protection Layer for Molecular Electronics: A Quantative Structural Study

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Solving the interface problem between the organic and inorganic layers in molecular electronics have been the focus of much research the last few decades.[1] Here we investigate monolayer graphene oxide (mGO) as a protecting blocking layer between organic thin films and vapor deposited Ti/Al metal top electrodes.[2] Langmuir-Blodgett (LB) films of cadmium(II)behenate were used as a model systems for fragile organic thin films. The mGO protected LB films were examined with atomic force microscope (AFM) and X-ray reflectivity (XRR), with and without the metal top electrodes. The use of XRR allow for a detailed depth profiling of the organic film and mGO layer below the metal top layers. We find that the structure of the mGO protected LB films is perfectly preserved, contrary to that of unprotected films where it is well documented that the metal deposition completely destroys the structure of the two first LB layers.[2] This study provides detailed structural evidence for the efficient use of mono atomic layers of GO as protective interlayer for molecular thin films in optoelectronic devices.

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2) *Cote, L. J.; Kim, F.; Huang, J. X. J. Am. Chem. Soc.* ***2009****, 131, 1043.*

3) *Hansen, C. R.; Sorensen, T. J.; Glyvradal, M.; Larsen, J.; Eisenhardt, S. H.; Bjornholm, T.; Nielsen, M. M.; Feidenhans'l, R.; Laursen, B. W. Nano Lett.* ***2009****, 9, 1052.*

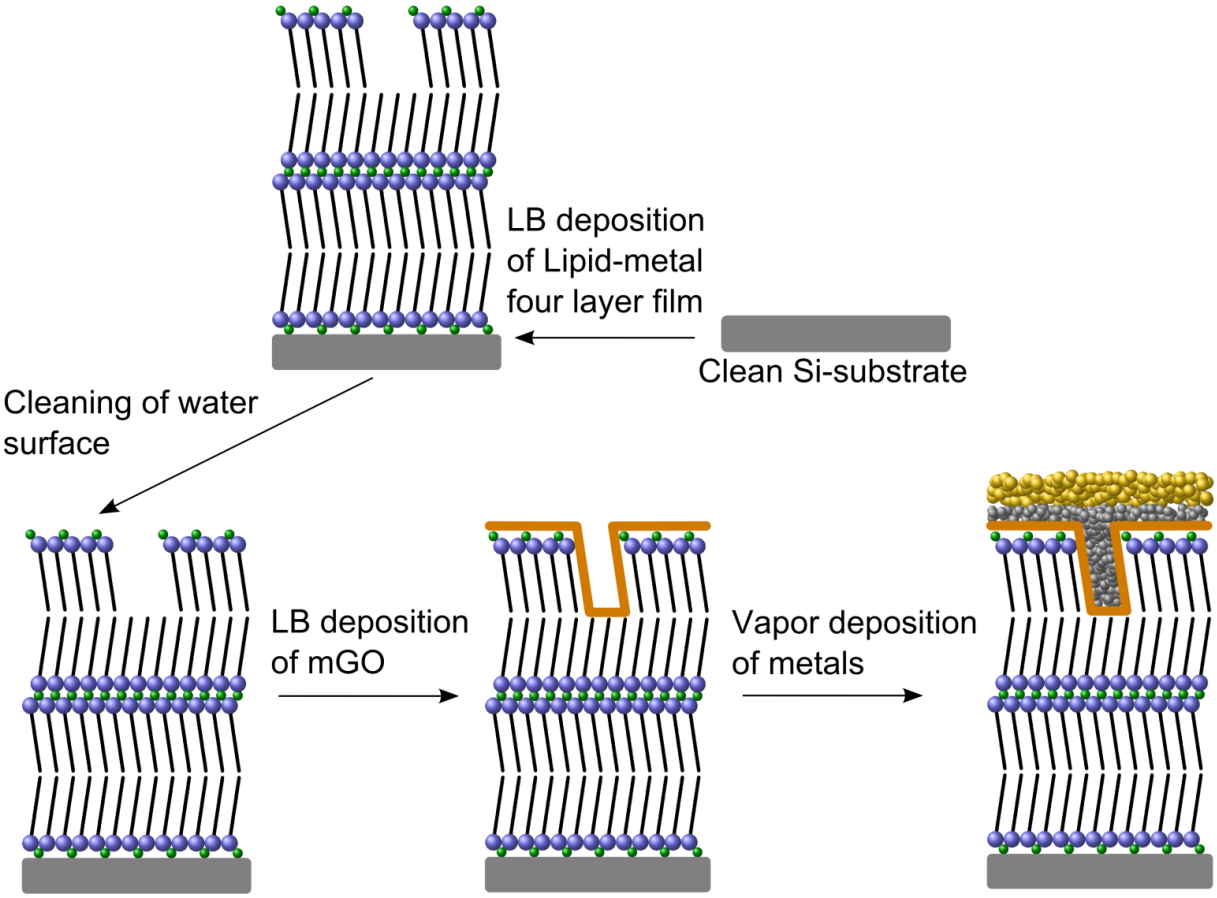

Figure 1 Deposition scheme of fatty acid metal salt-mGO hybrid film. Four layer Y-type LB-films of cadmium(II)behenate was first deposited on cleaned Si-wafers. Secondly, while the four layer film was kept submerged, the water surface was thoroughly cleaned for lipids followed by deposition of mGO. The mGO-film was then transferred by vertical deposition. Lastly, the film was covered by metal thin films.

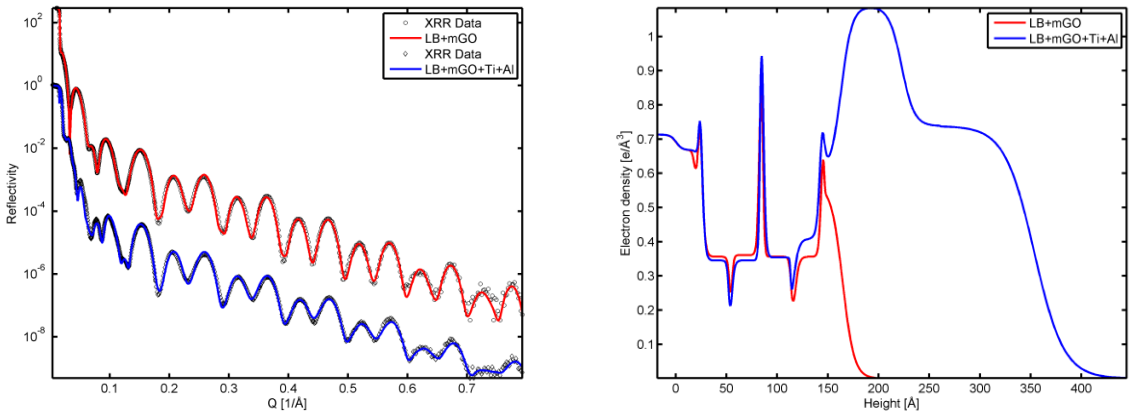

Figure 2. Left: XRR data and fits for i) four-layer cadmium(II)behenate + GO LB-film on Si/SiO_2 (red) ii) four-layer cadmium(II)behenate + GO LB-film with 50 Å Ti + 100 Å Al on Si/SiO_2 (blue). The circles represent the data while the solid lines corresponds to the modeled fits. The red curve has been offset for clarity. Right: The electron density profile resulting from the fits on the left. The barrier effect from the mGO is here clearly visible from the intact Cd^{2+}-peaks. The slight increase in electron density is attributed to the natural occurring holes in the top lipid film.