Electronic Supplementary Information

Lipid Nanoscaffolds in Carbon Nanotube Arrays

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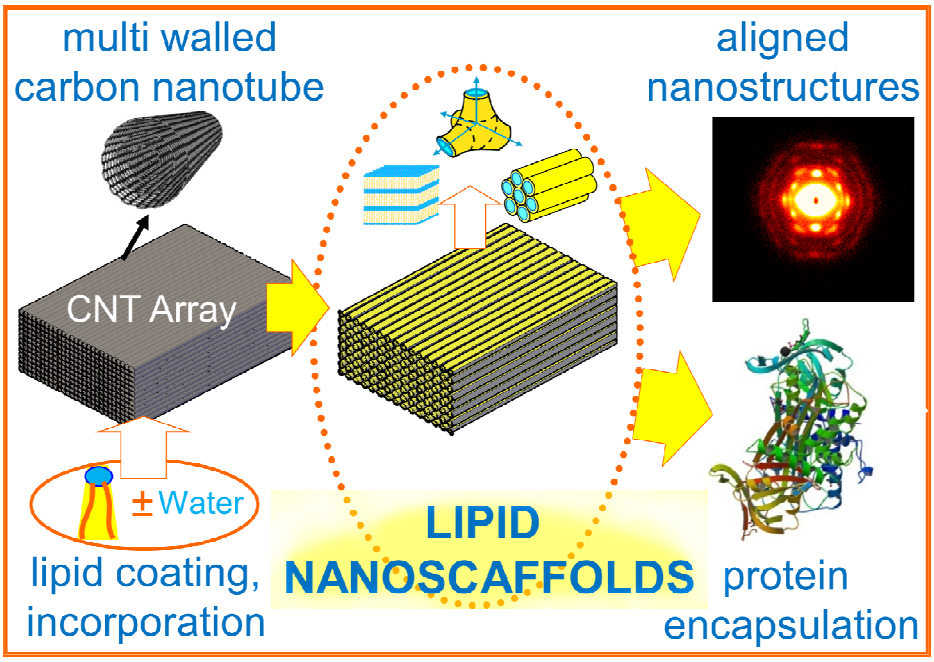

Figure SI1: Schematic diagram summarizing the paper: In this article we have employed carbon nanotube arrays which were fabricated from highly aligned multiwalled carbon nanotubes

(CNTs). The CNT arrays were loaded with lipid molecules which self-assembled into remarkable nanostructures in dry and hydrated states. Lamellar (1-D), hexagonal (2-D) and cubic (3-D) nanostructures were formed under hydrated condition which exhibited an alignment character due to orientation induced templating by the CNT arrays. Surface functionalization and nanostructural features of lipid molecules within the CNT arrays facilitated encapsulation of egg white ovalbumin proteins which was otherwise not possible. In this manner, the lipid nanoscaffolds can be used for potential applications in various biotechnological applications, such as portable model membranes and protein hosting nanoscaffolds.

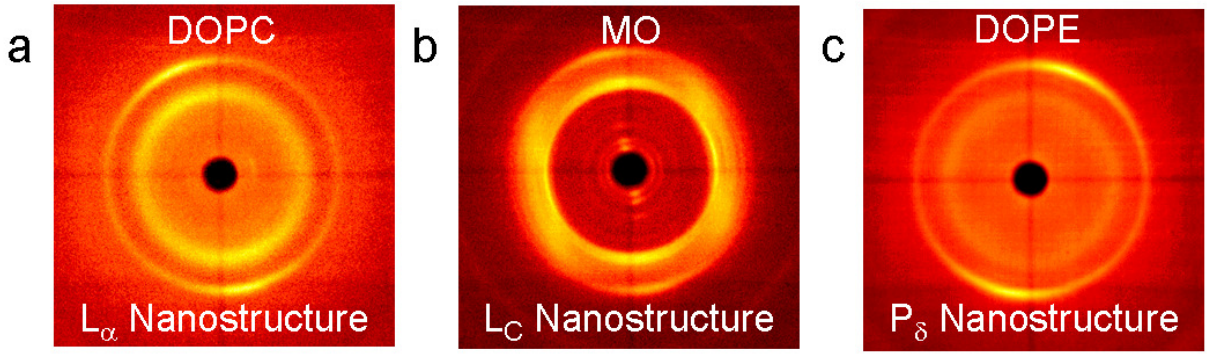

Figure SI2: Signs of the alignment of lipid nanostructures in WAXS: Along with the SAXS studies, some of the WAXS patterns also showed features of alignment of lipid nanostructures due to templating of CNT arrays. It is clearly visible from the central image of L_C nanostructure of dry MO at ambient temperature (**b**,). However, fluid lamellar (L_α) and rippled gel (P_δ) lamellar polymorphs for DOPC (**a**,) and DOPE (**c**,), respectively do not display such strong alignment because the lipid headgroups are rather fluid and less ordered than in L_C nanostructure. Alignment of CNTs is visible from outer ring.

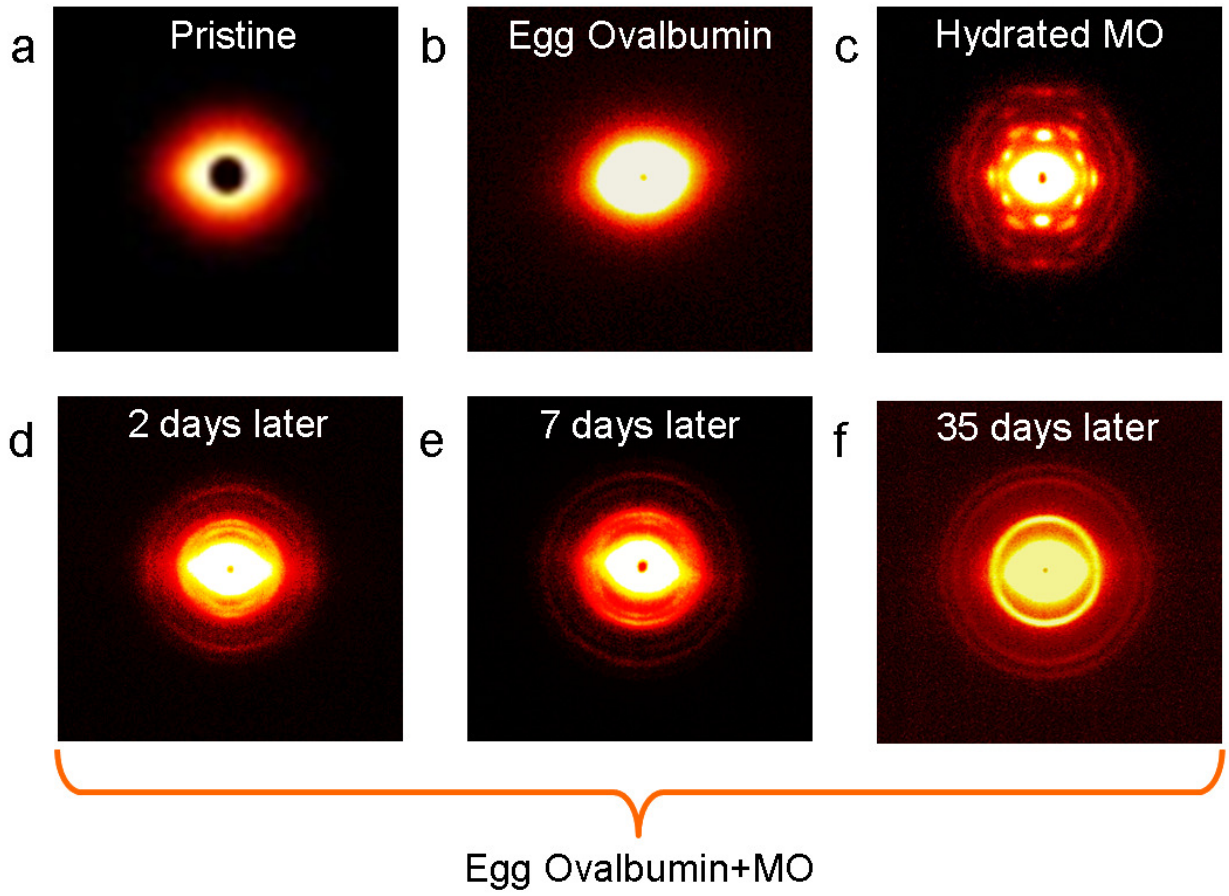

Figure SI3: 2-D SAXS patterns of egg ovalbumin encapsulation in lipid nanoscaffolds: Original patterns to be compared with the 1-D intensity vs 2θ plots elucidating the role of lipid loading in the encapsulation of egg ovalbumin in the CNT arrays. **a**, pristine CNT arrays show characteristic pattern of distorted bright circle studied in the direction of orientation of the CNTs. **b**, Egg ovalbumin does not practically incorporate among the arrays therefore no specific pattern was observed. **c**, hydrated MO shows fascinating alignment of Pn3m cubic phase. **d**, A mixture of egg ovalbumin and MO interacts with the arrays and thereby show some Pn3m signatures as well as the rings for newly evolving H_2 nanostructure. **e**, and **f**, due to interaction of ovalbumin with the lipid molecules the Pn3m nanostructure fades away in a week, while the H_2 nanostructure is clearly stabilized after about 5 weeks.