Supporting Information:
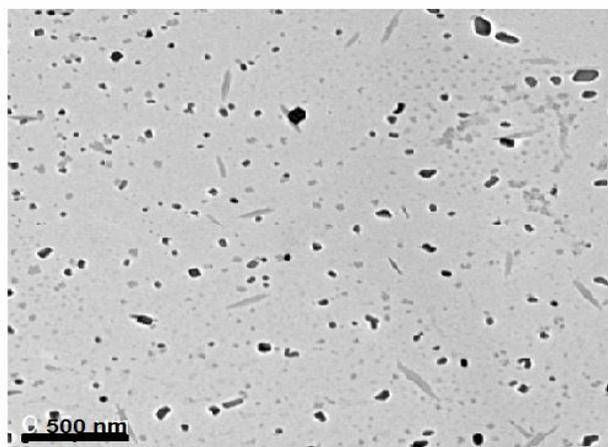
Figure S1 Transmission electron microscopy of sonicated SWNT nanorope

The water soluble lipid functionalized SWNTs forms a "nanorope" structure. When the SWNT nanorope experience a mild sonication the self assembly breaks down which is reflected in Figure S1.
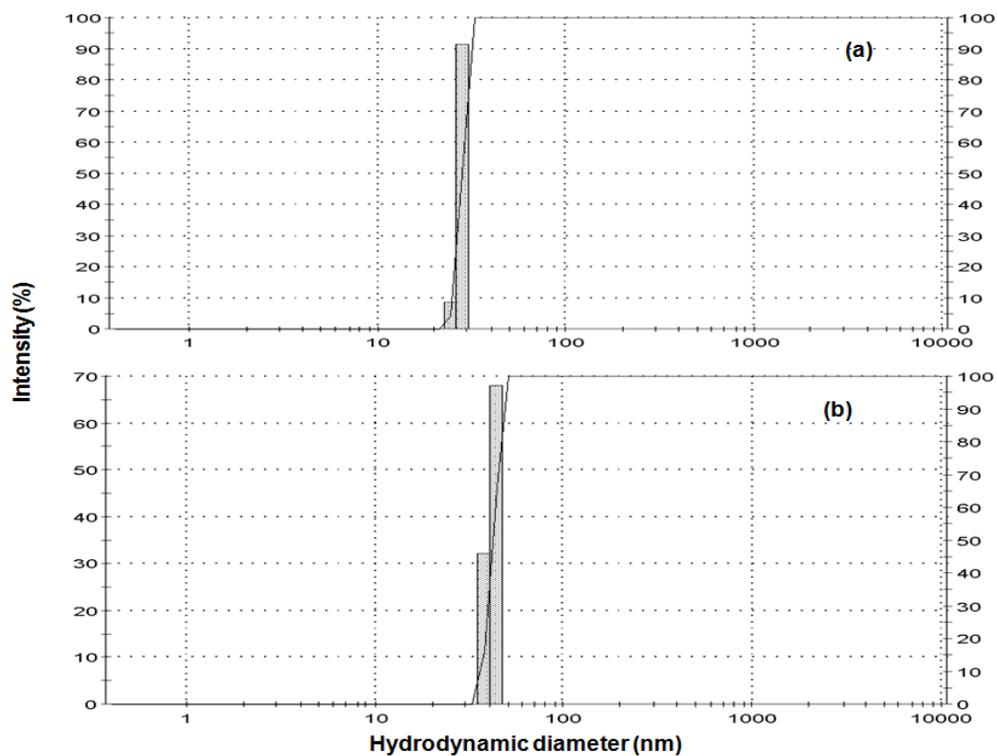
Figure S2 Hydrodynamic diameters of (a) nanorope (b) nanorope entrapped GOD-POD

1
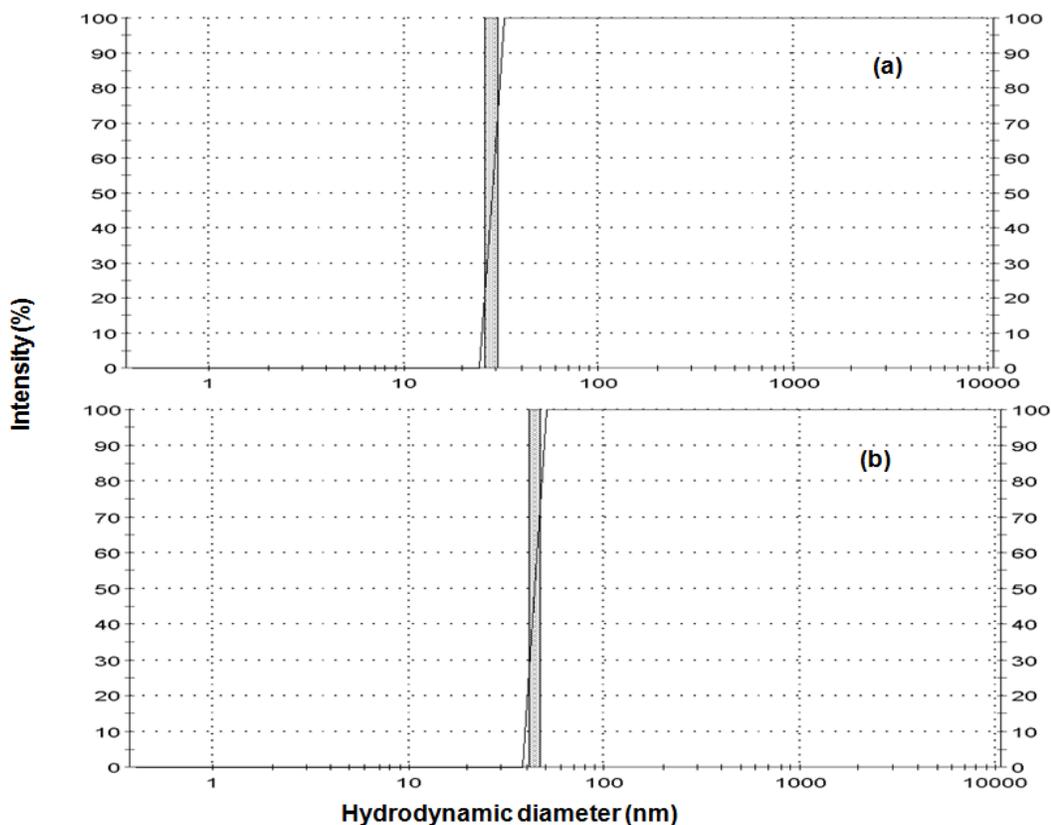
Figure S3 Hydrodynamic diameters of (a) nanorope (b) nanorope entrapped GOD-POD after sonication preceded by centrifugation and self-assembly

The hydrodynamic diameters of nanorope and the enzyme (GOD-POD) entrapped nanorope were found to be ~ 28 nm and ~ 42 nm respectively (see Figure S2 (a) and Figure S2 (b) respectively). The hydrodynamic diameter of nanorope was again determined and observed at ~ 28 nm (see Figure S3 (a)) after centrifugation and self-assembled again preceded by sonication. When the nanorope was allowed to self assemble with enzyme, the hydrodynamic diameter of enzyme entrapped nanorope was found to be at ~ 44 nm (see Figure S3 (b)).
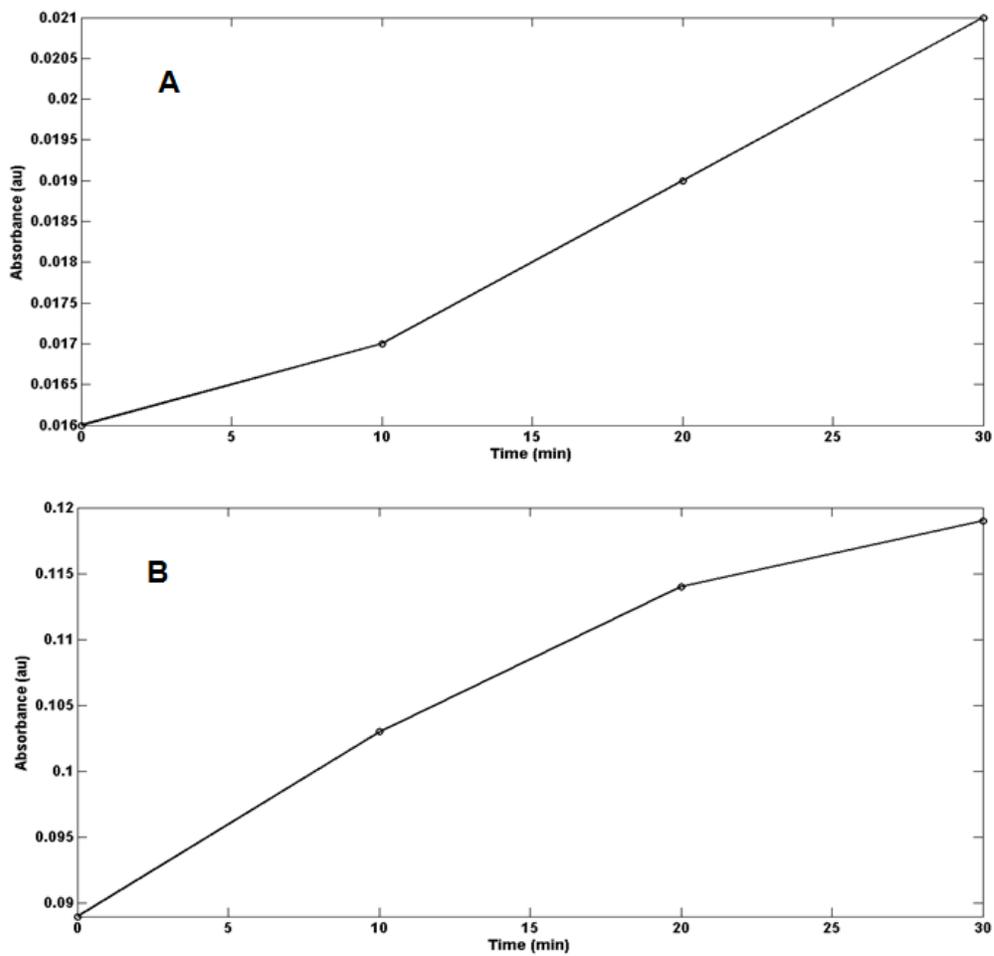
Figure S4 Kinetics study of (A) alkaline phosphatase and (B) citrate synthase only

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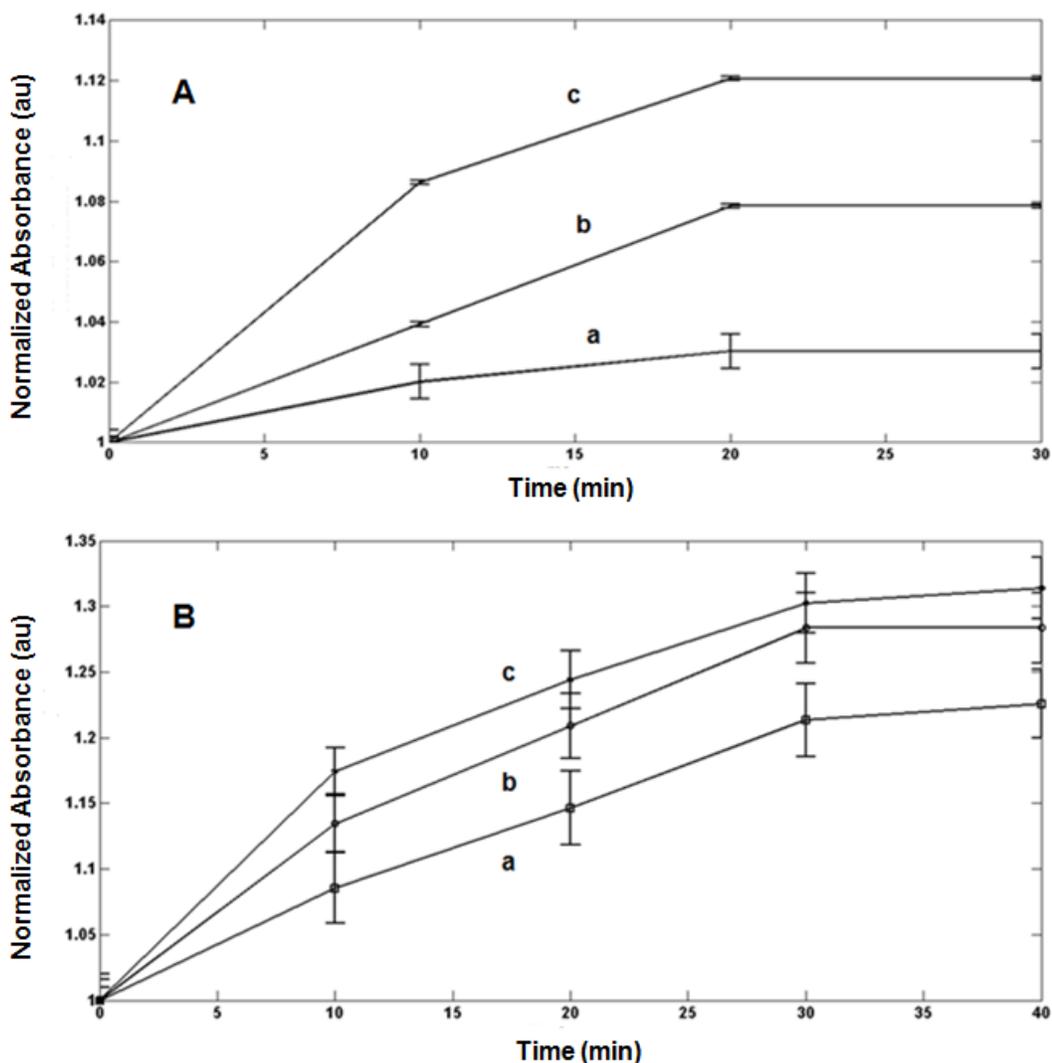
Figure S5 Normalized enzyme catalyzed reaction of [A] entrapped alkaline phosphatase with substrate concentrations (a) 0.025 mg/ml, (b) 0.05 mg/ml and (c) 0.1 mg/ml and [B] entrapped citrate synthase with substrate concentrations (a) 0.025 mg/ml, (b) 0.05 mg/ml and (c) 0.1 mg/ml

The catalytic activity of entrapped enzymes is significantly higher (see Figure S5) in comparison with free enzymes (see Figure S4) and the catalytic activity increases upon substrate concentrations. The better packing of the enzymes in between the nano-porous cargo results the better catalytic activity.

4
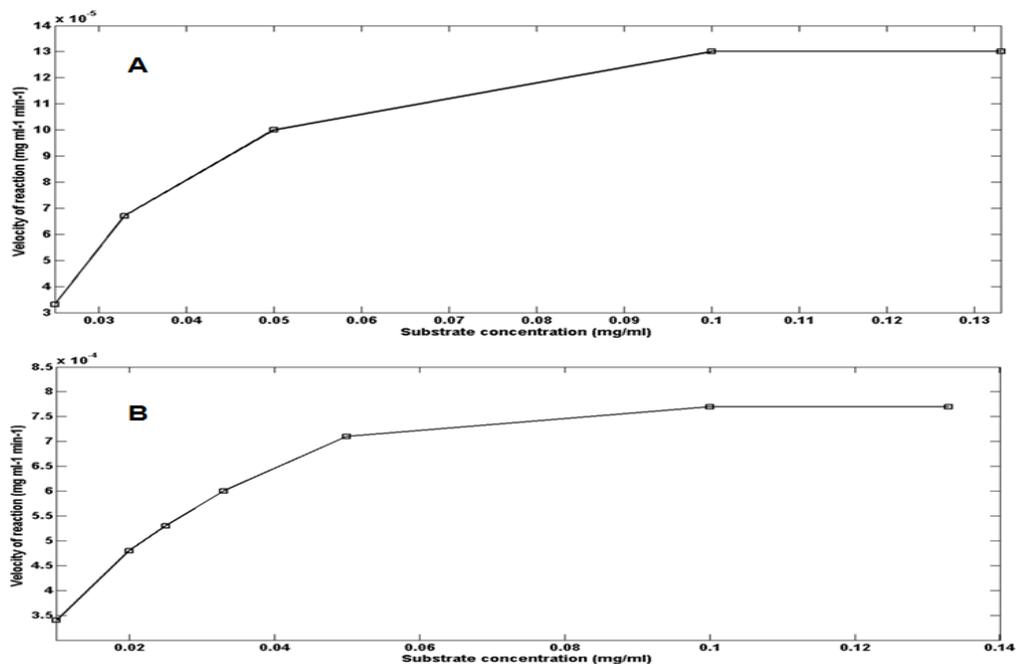
Figure S6 Kinetics study of [A] entrapped alkaline phosphatase and [B] entrapped citrate synthase
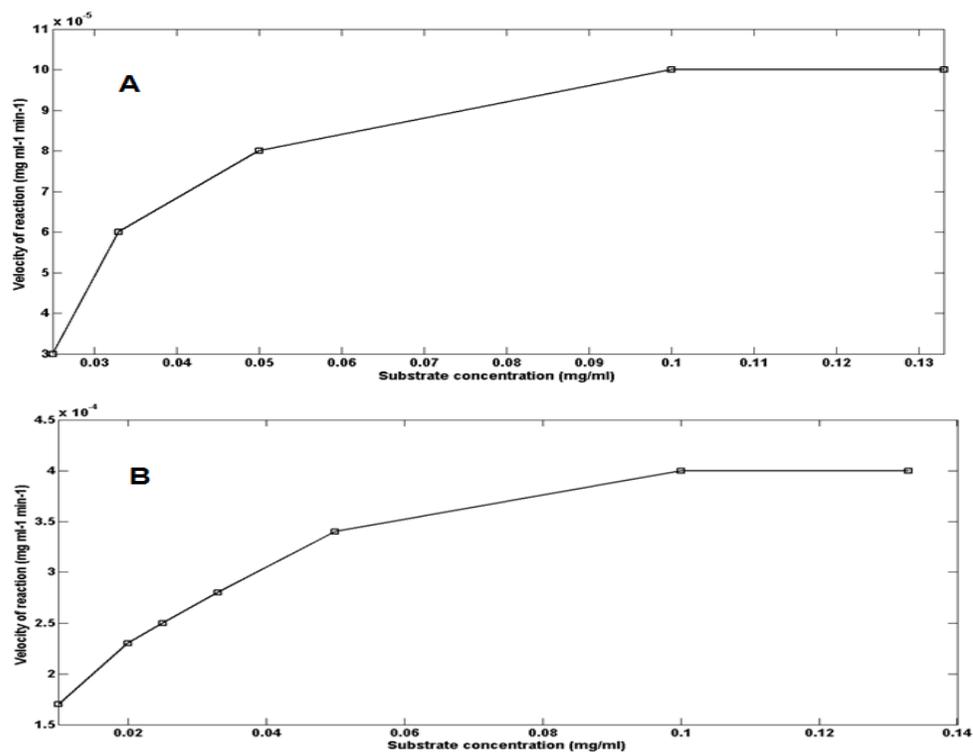
Figure S7 Kinetics study of [A] entrapped alkaline phosphatase after reuse and [B] entrapped citrate synthase after reuse

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The entrapment actually enhances the enzymatic catalytic activity and affinity upon better packing due to the noncovalent interactions. The V_{max} and K_m value (13×10^{-5} mg ml^{-1} min^{-1}, ~0.033 mg ml^{-1}) of alkaline phosphatase and for citrate synthase (77×10^{-5} mg ml^{-1} min^{-1}, ~0.019 mg ml^{-1}) trapped in nanoropes indicates the signature of entrapment as shown in Figure S6 (A) and Figure S6 (B) respectively. Though the V_{max} and K_m value (10×10^{-5} mg ml^{-1} min^{-1}, ~0.028 mg ml^{-1}) of alkaline phosphatase, and the V_{max} and K_m value (40×10^{-5} mg ml^{-1} min^{-1}, ~0.013 mg ml^{-1}) of citrate synthase entrapped in nanorope after reuse is less, compared to the V_{max} and K_m values of previously entrapped enzymes within nanoropes as shown in Figure S7 (A) and Figure S7 (B) but it ensures that the molecular trap can be reused for several times without much degradation of enzymatic activity.

Thus it can be inferred that this SWNT nanorope (functionalized by solid state chemistry) can be used as a versatile molecular trap (a new molecular machine) for wide applications characterization, immobilization and various related applications.