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Developing "SMART" Nano by Nano System for Efficient Liposome Delivery in vitro

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Nanotechnology-based cargo delivery to cells is a promising assay due to its efficiency and biocompatibility. Time-consuming and uncontrollable deliver amount are still thresholds in related research. In this study, we design a nanopillar-based platform for liposome delivery in vitro. Thermoreponsive copolymer (p(NIPAm-co-AEMA)) is grafted from silicon nanowire (SINW) as a polymer nano brush to equip temperature-controllable liposome conjugations of the SINW. A liposome is introduced onto the polymer nano brush to form a nano-by-nano interface and is released through thermal-stimuli to generate a high local concentration for cellular uptake. Cryo-TEM images show that liposomes can attach to the polymer nano brush to form liposome-tethered nanopillars. Fluorescence quantifications suggest that up to 90% of the attached liposomes can be released with intactness. Furthermore, HEK 293T cell and calcein-loaded liposome are employed to investigate the cellular uptake kinetics. We found that the cellular uptake kinetic of HEK 293T cell is highly correlated to temperature stimulus in the nano-by-nano system. Fluorescence intensity difference quantified by flow cytometry indicate elevated cellular uptake efficiency, which is more than 10-fold increments at 4-hour incubation. Confocal images show that the liposomes stay at cytoplasm instead of lipid membrane after cellular uptake. In conclusion, we could deliver liposome to cells efficiently with the designed system and we hope these efforts could open a new era in biological engineering and tissue engineering.

Biography

Mr. Gautam received his master degree in Chemical Science from Institute of chemical technology (ICT), Mumbai, India. After completing his master degree he worked 2 years as Research Assistance at Aditya Birla Science and Technology Company. He is currently a pursuing his Ph.D. study at Institute of Chemistry, Academia Sinica, Taiwan.

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