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**IT-7-P-6054 In-situ observation of gold nanorod self-assembly**

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Self-assembly organize gold nanorods (AuNRs) encapsulated by cetyltrimethylammonium bromide (CTAB) bilayer into an ordered material. The adsorbed molecules not only stabilize colloidal dispersion but also create "glue" among nanorods in the superlattice. Configurational entropy and depletion mediated interactions are commonly considered in the process of supracrystals growth. However, many questions arise about the dynamics of self-assembly in general and particularly about gold nanorods self-assembly in drying colloidal drop. Here we demonstrate the visualization of the dynamic behaviour of the AuNRs (20 nm x 60 nm) in viscous CTAB/water environment using scanning transmission electron microscopy (STEM) in environmental conditions (STEM-in-ESEM). We observed several distinct stages of AuNRs self-assembly at the liquid-gas interface under space confinement, during controlled evaporation of solvent. The formation of free standing membrane of close-packed nanorods with vertical orientation around the inner edge of the carbon membrane hole, the formation of side-by-side AuNR chains and the sensitivity of the self-assembly process to the irradiation of the electron beam will be shown. Moreover, the viscous environment of the membrane enables to observe the dynamics of the self-assembly process on timescale of seconds. Particular events can be traced such as the nucleation and growth of the 2D crystals around the rim of the holey carbon membrane, the slowing down of the Brownian motion of loose tip-to-tip rod assemblies and convective flows in nano-environment revealed by their collective translation movement besides and the effects of the electron probe upon the prolonged exposure. A time lapse series of micrographs will used to demonstrate such capability.

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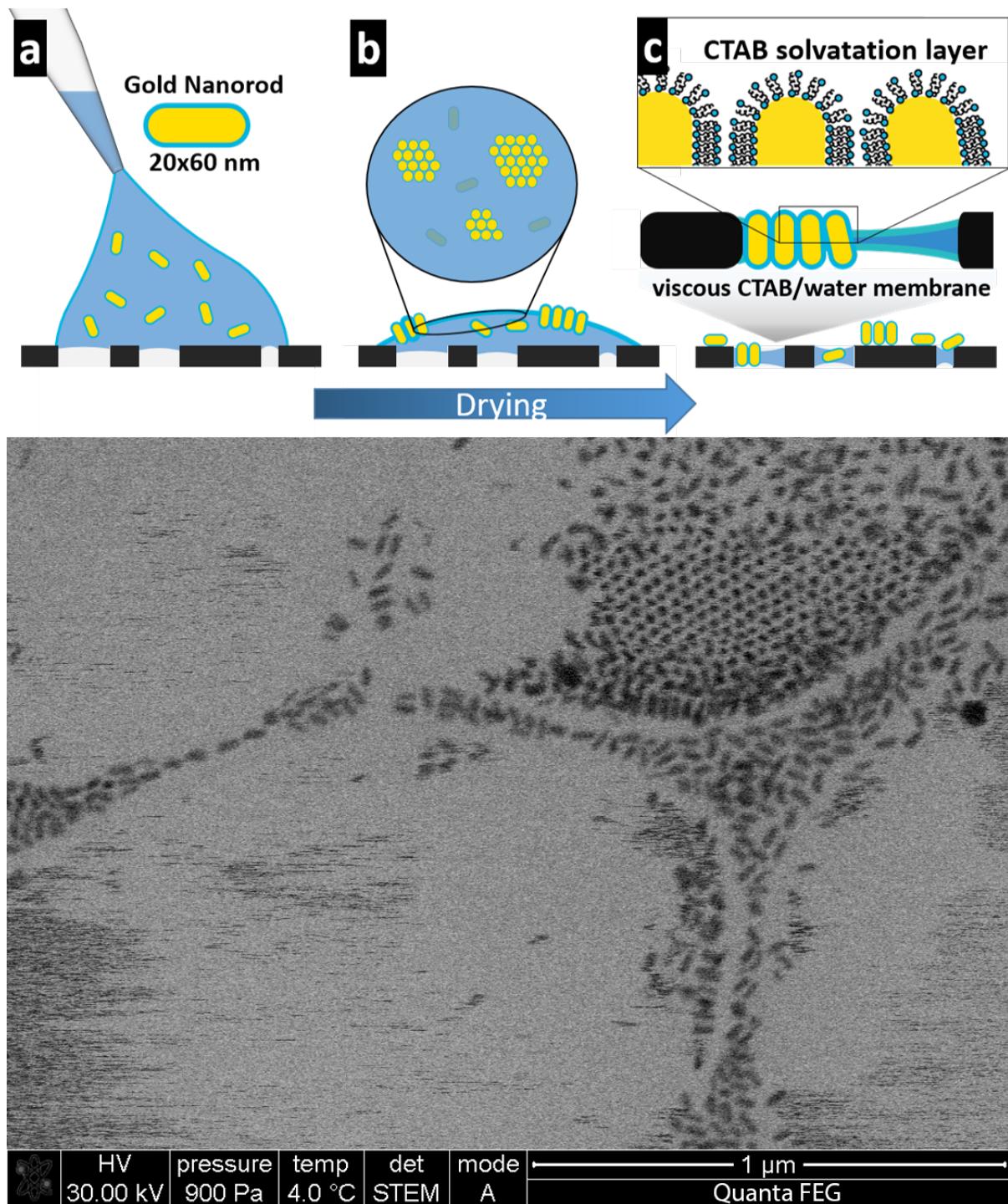


Fig. 1: Scheme of in-situ observation of self-assembly of AuNRs. (a) AuNR solution is deposited on top of a holey carbon TEM grid. (b) Droplet undergoes rapid evaporation. (c) Collapsed drop concentrates the AuNR/CTAB volume to form a electron transparent hydrated viscous membrane. (below) Micrograph of AuNR array forming inside holey opening.