Macroscopic 3D plasmonic superlattice arrays by evaporative self-assembly

With the support by the National Natural Science Foundation of China and Science and Technology Key Project of Shenzhen, the research team led by Prof. Yu Xuefeng (喻学锋) from Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, cooperated with the team led by Prof. Paul K. Chu from the City University of Hong Kong, and reported recently on the fabrication of macroscopic 3D plasmonic superlattice arrays by evaporative self-assembly of gold nanorods, which was published in *Adv Mater*, as an inside front cover story (2016, 28: 2511-7).

The buildup of three-dimensional superlattice by the ordered self-assembly of nanoparticles has become the cutting-edge technology in the research field of nanomaterials. The ordered structure formed with the nanoparticles renders collective electro-optical properties, therefore, has great potential in display device, sensors, solar cells, optical fiber communications and other fields. Droplet evaporative self-assembly is a simple and effective technique used to build the superlattice structure. However, the well-known coffee-ring effect often results in the uneven deposition of nanoparticles, thereby seriously hindering the ordered packing of the nanoparticles. The research teams established an effective approach to reverse the coffee-ring effect. By simply regulating the surface chemistry of gold nanorods and substrate, they obtained three-dimensional plasmonic superlattice on the millimeter scale, which consisted of highly ordered and vertically aligned gold nanorods and exhibited excellent Raman enhancement and optical uniformity. With the same mechanism, this effective method can be extended to a variety of different nanomaterials to build three-dimensional superlattice.

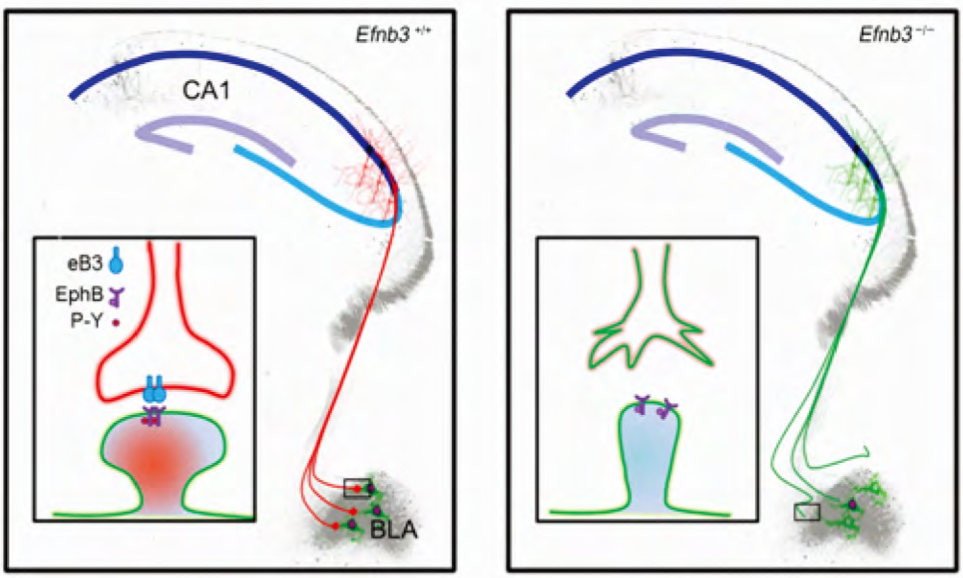

Figure Evaporative self-assembly of gold nanorods into macroscopic 3D plasmonic superlattice arrays.

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