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Fabrication of multiplexed plasmonic nanoparticle structures based on AFM lithography

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Precisely positioning of plasmonic nanoparticles into multiplexed nanostructures with high controllability and reproducibility plays an important role for emerging advanced device applications. Many techniques employed to produce multiplexed nanostructures are limited by complicate fabrication process and difficulties with scalability. Here the work reports a scalable strategy to fabricate multiplexed plasmonic nanoparticle structures by mechanical scratching with AFM lithography. Under the assistance of polymer resist, gold nanoparticles assembled on the silicon substrate can be directly scratched by AFM tip to form well defined nanostructures, and different size or shape of gold nanoparticles can be controllably scratched at a high speed of 1000 μm/s and remain the same integrity of particle arrays after removing the polymer. By precisely controlling the scratching loading force, multiplexed nanostructures of plasmonic nanoparticles can be further achieved which demonstrate multiplex plasmonic properties and surface-enhanced Raman scattering (SERS) responses. When the multiplexed nanostructure is further integrated into organic light-emitting diodes device, it intuitionisticly expresses multiplexed plasmonic effects on the device performance. It gives a new aspect for multilevel assembly to the application of multiplexed SERS response or exploration for the plasmon enhanced devices.

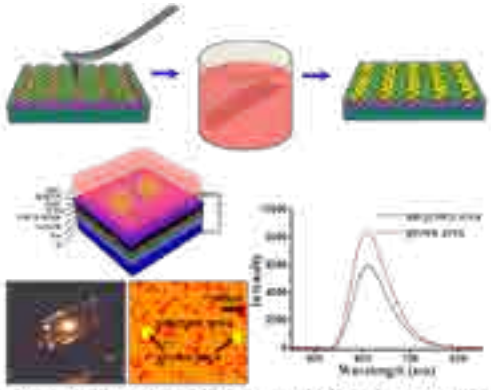

Figure 1. Schematic illustration of fabricating multiplex gold nanoparticle structures by chemical in-situ growth and corresponding plasmon effects on OLEDs performance.

Biography

Jianmei Chen received her BEng in Chemical Engineering and Materials Science from Shandong Normal University, Shandong, China, in 2011. She received her PhD degree in Material Science and Engineering from Institute of Functional Nano and Soft Materials (FUNSOM), Soochow University, Jiangsu, China, in 2017. She mainly focuses on the AFM lithography technique and application of Kelvin probe microscope in charge storage in dielectric material, plasmonic nanostructures fabrication and application in optoelectronics

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