Extending nanoscale patterning with multipolar surface plasmon resonances, Issam Kherbouche, Danielle MacRae, Théo Geronimi Jourdain, François Lagugné-Labarthet, Azedine Lamouri, Alexandre Chevillot Biraud, Claire Mangeney *and Nordin Félidj *, ***Nanoscale***, 2021,**13**, 11051-11057

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Abstract :

Plasmonic excitation of metallic nanoparticles can trigger chemical reactions at the nanoscale. Such optical effects can also be employed to selectively and locally graft photopolymer layers at the nanostructure surface, and, when combined with a surface functionalization agent, new pathways can be explored to modify the surface of a plasmonic nanoparticle. Among these approaches, diazonium salt chemistry is seen as an attractive strategy due to the high photoinduced reactivity of these salts. In this work, we demonstrate that it is possible to trigger the site-selective grafting of aryl films derived from diazonium salts on distinct nano-localized area of single gold nanotriangles, by taking advantage of their multipolar localized surface plasmon modes. It is shown the aryl film will preferentially graft in areas where the electric field enhancement is maximum, independently of the considered excited surface plasmon mode. These experimental findings are in very good qualitative agreement with the calculations of the local electric field, using the finite-difference time-domain (FDTD) method. We believe that this plasmonic-based approach will not only pave a new way for the spatially controlled surface functionalization of plasmonic nanoparticles, but also provide a general strategy to attach distinct molecules to hot spot regions on a single nanoparticle, opening promising prospects in sensing and multiplexing, and optically nano-scale patterning of functional groups.

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