

Self-assembly of predesigned optical materials in nematic codispersions of plasmonic nanorods

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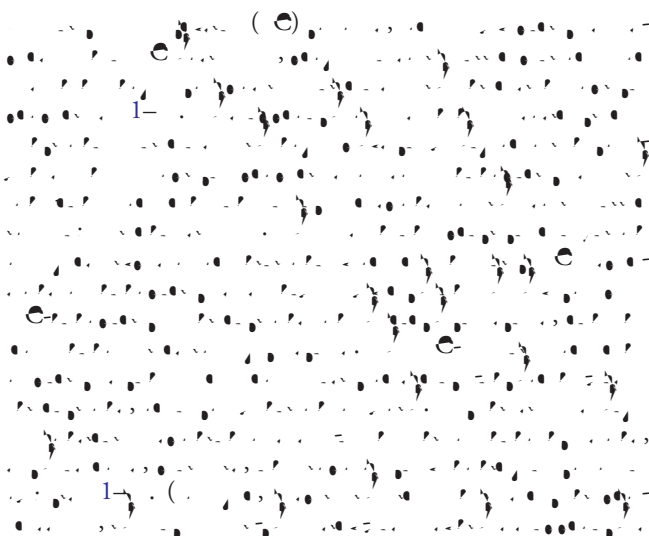
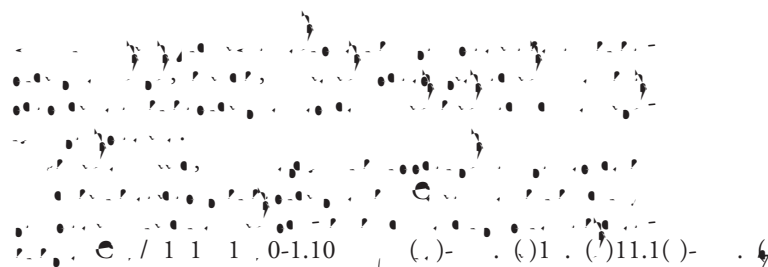
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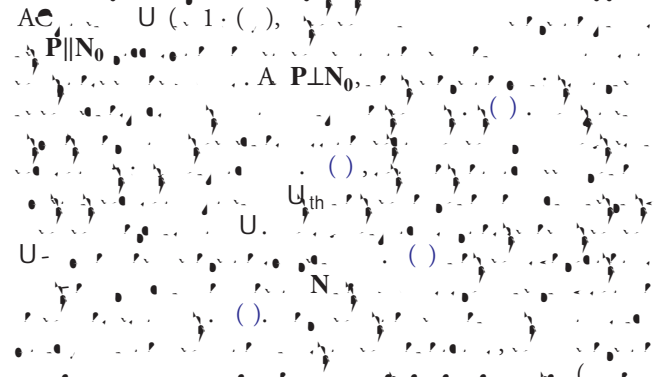
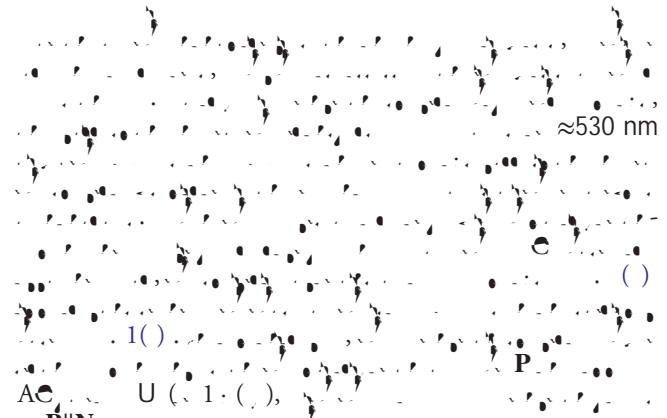
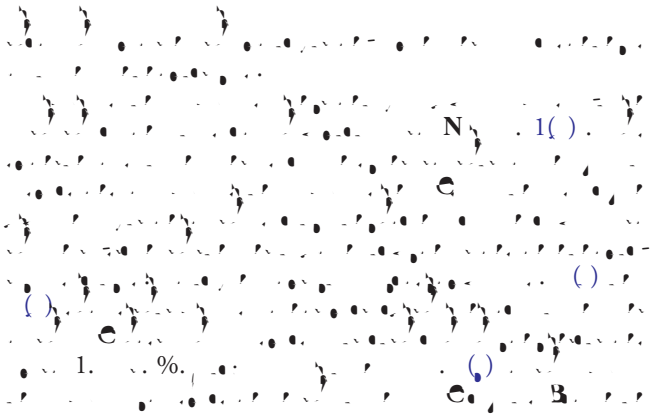
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Optical metamaterials and other nanostructured metal-dielectric composites hold great potential for designing and practically realizing novel types of light-matter interactions. Here we develop an approach to fabricate composites with tunable pre-engineered properties via self-assembly of anisotropic nanoparticles codispersed in a nematic liquid crystal host. Orientations of plasmonic nanorods of varying aspect ratios are controlled to align parallel or perpendicular to the nematic director and retain this relative orientation during a facile electric switching. The ensuing dynamic reconfigurability of the surface plasmon resonances of a composite enables a previously inaccessible means of controlling light and may enable tunable plasmonic filters and polarizers. © 2016 Optical Society of America

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$$S_{\text{GNR}} = (3 \cos^2 \theta_{\text{GNR}} - 1) / 2$$

$$S_{\text{GNR}} = (A_{\parallel} - A_{\perp}) / (A_{\parallel} + 2A_{\perp}), \quad S_{\text{LGNR}} = 0.58, \quad S_{\text{SGNR}} = 0.50,$$

