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Excitation of surface plexciton wave at interface of a metallic thin film and an S- shaped nematic dielectric thin film doped by Cyanin pigments

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Abstract

In this study, the interaction between plasmons and excitons in a two-layered structure within a Kretschmann configuration is classically studied using optical modeling based on the transfer matrix method. The plasmonic medium consists of silver, while the excitonic environment comprises three components: air, J-aggregated cyanine molecules, and an S-shaped dielectric thin film made of magnesium fluoride. Light propagation in the structure occurs with TM polarization. To analyze the plexcitonic spectrum, the optical absorption is plotted as a function of the incident photon energy for the metal, the semiconductor, and the entire structure. By comparing the obtained spectra, plasmon-exciton coupling is investigated, along with the effects of various structural parameters on it. The optical modes arising from plasmon-exciton coupling can have potential applications in photonic sensors, quantum information processing, and optical switches.

Keywords: plasmon, exciton, plexciton, nematic thin film

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