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Polarization and Angle Dependent Spontaneous Emission Rates in Hybrid Metal-Semiconductor Nanostructures YIKUAN WANG, TIANYU YANG, MARK TUOMINEN, MARC ACHERMANN, University of Massachusetts Amherst — Recently, the coupling of a dipole emitter to surface plasmons (SPs) of metal nanostructures has attracted much attention for its potential applications in light emitting devices. Our time-resolved photoluminescence (PL) study on the emission of CdSe/ZnS core/shell nanocrystals (NCs) deposited on a two-dimensional array of gold nanodiscs demonstrates that the spontaneous emission of dipole emitters is strongly dependent on the detection angles and polarizations. The in-plane, s-polarized PL measurements are independent on detection angles, and can be described by the PL decay dynamics of two NC subsets: the emission from NCs on the dielectric substrate and from NCs on the gold nanodiscs that experience non-radiative quenching by the metal structures. The out-of-plane, p-polarized PL measurements show an additional decay caused by SP-induced enhancement of the spontaneous emission rate. This angular-dependent enhancement is explained by interactions between NC dipole moments and the out-of-plane SP resonance of the gold nanodiscs.

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