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Plasmon enhanced photoluminescence in dye doped films coupled to random metal aggregates SHIKHADEEP GILL, MIRIAM DEUTSCH, University of Oregon — We present a study of plasmon enhanced light emission from metal/dielectric composites comprising aggregated nanocrystalline silver islands deposited onto thin polymer films which have been doped with the amplifying dye Rhodamine 6G. We address the dependence of dye photoluminescence on the morphology of the metal aggregates as additional silver is added to the films. A frequency doubled Nd:YAG laser is used as the pump for exciting both the gain medium as well as localized surface plasmons in the metal aggregates. We exploit the intense plasmon fields localized to the metal islands to obtain greatly enhanced luminescence signals. In addition, the large scattering cross sections sustained by the metal nanoparticles serve to further increase light-molecule interaction in this system. We discuss the dependence of luminescence enhancement factors on the material's structural properties, and show that maximal signals are obtained when metal islands begin to coalesce. Using films in the coalescence regime, we then proceed to discuss the dependence of dye emission on pump power, and address the prospects for achieving plasmon-enhanced random lasing in these materials.

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