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Determining the mechanism of metal-enhanced multiphoton absorption polymerization JOHN FOURKAS, University of Maryland, SANGHEE NAH, LINJIE LI, JUNJIE HAO — Multiphoton absorption polymerization has been demonstrated by a number of groups to occur considerably more efficiently near noble metal nanostructures. It is generally assumed that the mechanism underlying this increased efficiency is an increase in the effective two-photon absorption cross-section due to field enhancement from the nanostructure. However, we have recently demonstrated that for small aggregates of gold nanoparticles, multiphoton absorption drives broadband luminescence that can expose a photoresist directly through single-photon absorption. In this talk we will show that the same mechanism is responsible for metal-enhanced multiphoton absorption polymerization (MEMAP) for a range of different metal nanostructures. In fact, we have yet to find a system in which field enhancement leading to enhanced two-photon absorption of a photoinitiator is responsible for MEMAP. These observations suggest that we need to rethink the mechanisms of other nonlinear optical phenomena in metal nanostructures, including surface-enhanced Raman scattering.

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