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Magnetic Quenching of Plasmon-photonic Activities in Fe_3O_4-Elastomer Composite[1] DANHAO MA, DUSTIN HUSS, PRALAV SHETTY, The Pennsylvania State University, RICHARD BELL, The Pennsylvania State University, Altoona College, MAURICIO TERRONES, The Pennsylvania State University, KOFI ADU, The Pennsylvania State University, Altoona College — We report for the first time, a systematic study of polarization dependence and the effect of particle size on the optical response of Fe_3O_4-silicone elastomer composites in the presence of external magnetic field. The optical response of composites containing 2wt%, 5wt% and 15wt% of 20nm$\leq$d $\leq$30nm, 40 nm$\leq$d$\leq$ 60nm and d$\leq$ 500nm Fe_3O_4 particles were aligned in- and out-of-plane in the elastomer host. We observed a systematic redshift in the optical response of the out-of-plane composite samples (containing nanoparticles 20nm$\leq$d$\leq$30nm) with increasing static magnetic field strength, which saturated near 600 Gauss. There were no observable shifts in the in-plane samples, suggesting that the orientation (polarization) of the magnetic dipole and the induced electric dipole play a crucial role in the optical response. However, we observed a dramatic suppression to near quenching of the plasmonic activities in the micron size particles (d $<$ 500nm) elastomer composite, suggesting particle size limitations in modulation of plasmon-photonics by external magnetic field. Dipole approximation model is used to explain the quenching phenomenon.

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