Abstract Submitted
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Large Cubic Nonlinearity of Silver Nanoparticles S.M. MA, Q. YANG, R. BATTLE, L. CREEKMORE, B. TABIBI, J.T. SEO, Hampton University, W.J. KIM, J.H. HEO, W.S. YUN, D.H. HA, S.S. JUNG, Korea Research Institute of Standards and Science, E. BRYANT, C. PAYNE, W. YU, V. COLVIN, Rice University, . TEAM, . COLLABORATION, . COLLABORATION — The cubic nonlinearity of Ag nanoparticles (NPs) with average sizes of $\sim$ 112 nm and $\sim$4 nm were investigated using polarization-resolved degenerate four-wave mixing (DFWM) at the regions of non surface plasmon resonance (SPR). The absorption spectra and TEM pictures of Ag NPs with an average size of $\sim$112 nm indicated wide morphology of size and shape distributions, and those of Ag NPs with an average size of $\sim$4 nm provided narrow size distribution. The SPR absorption peaks of Ag NPs with average sizes of $\sim$ 112 nm and $\sim$4 nm were $\sim$420 nm with an inhomogeneous spectral shape and $\sim$424 nm with a homogeneous shape. The excitation source was a spatially Gaussian shaped, $\sim$6 ns pulsed laser with 10-Hz repetition rate operating at 1064- and 532-nm wavelengths for the DFWM spectroscopy. The concentration- and polarization-resolved DFWMs revealed that the hyperpolarizabilities of Ag NPs with average sizes of $\sim$ 112 nm and $\sim$4 nm were $\sim 1.05\times10^{-20}$esu and $\sim 4.19\times10^{-21}$esu, and $\sim 3.05\times10^{-26}$esu and $\sim 6.6\times10^{-27}$esu for parallel and orthogonal polarizations. The possible origins of large hyperpolarizability enhancement with the Ag NPs with average size of $\sim$112 nm are a dielectric resonance and edge effects of the existing nanorods and nanoplates in the NPs.

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