Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Dynamic tuning of lattice plasmon lasers with long coherence characteristics THANG HOANG, Department of Physics, Duke University, ANKUN YANG, Department of Materials Science and Engineering, Northwestern University, GEORGE SCHATZ, Department of Chemistry, Northwestern University, TERI ODOM, Department of Materials Science and Engineering, Department of Chemistry, Northwestern University, MAIKEN MIKKELSEN, Department of Physics, Department of Electrical and Computer Engineering, Duke University — Here, we experimentally demonstrate dynamic tuning of an optically-pumped lattice plasmon laser based on arrays of gold nanoparticles and liquid gain materials [A. Yang, T. B. Hoang et al., Nature Communications 6, 6939 (2015)]. The structure consists of an array of 120 nm diameter gold disks with a height of 50 nm and 600 nm spacing. A liquid gain material composed of IR-140 dye molecules dissolved in a variety of organic solvents is placed on top of the disks and held in place by a thin glass coverslip. At a lasing wavelength of 860 nm, time-resolved measurements show a dramatic reduction of the decay time from 1 ns to less than 20 ps when the optical excitation power density increases from below to above the lasing threshold, indicating the transition from spontaneous to stimulated emission. By changing the dielectric environment surrounding the gold disks in real time, the lasing wavelength can be dynamically tuned over a 55 nm range. Finally, we will discuss recent experiments where we probe both the temporal and spatial coherence properties of the lattice plasmon laser. This advance of tunable plasmon lasers offer prospects to enhance and detect weak physical and chemical processes on the nanoscale in real time.

Thang Hoang
Duke University

Date submitted: 06 Nov 2015 Electronic form version 1.4