Abstract Submitted
for the GEC06 Meeting of
The American Physical Society

Addressable Silicon Microplasma Arrays: Discharge Properties for Pixelized Microcavities having a Multi-Electrode Geometry P. TCHERTCHIAN, S.-H. SUNG, T.L. KIM, S.-J. PARK, J.G. EDEN, Laboratory for Optical Physics and Engineering, Dept. of Elect. and Computer Engr., University of Illinois — The demonstration of large array of microcavity plasma devices in Si has provided new platform for the efficient light sources and high resolution displays. Device structures with vertically stacked multilayers allow opportunities to modify the device geometry to meet specific requirements of addressability or to obtain microplasma array with high spatial resolution. In this paper, we report the performance of addressable Si microplasma arrays having multiple electrodes with various geometric configurations. Each microcavity is driven by two or three thin layer electrodes which are individually patterned and embedded in the multilayer structure. We have fabricated 20 x 20 and 50 x 50 arrays of inverted pyramidal Si microcavities having $(50\ \mu\mathrm{m})^2$ and $(100\ \mu\mathrm{m})^2$ emitting apertures and all of the microplasma operate at atmospheric pressure with various molecular ultraviolet emitters. Stable glow discharges are observed in mixtures of atomic or molecular gases, such as Xe in Ne and D_2, H_2O in Ar, excited by AC (sinusoidal) or bipolar voltage waveform. Discharge characteristics and the spatial profiles of microplasma emission are dependent on the discharge electrode configurations and the power addressing function. The $(100\ \mu\mathrm{m})^2$ microcavity device exhibits a higher UV emission intensity and efficiency than the $(50\ \mu\mathrm{m})^2$ device under identical operating conditions.

Sung-Jin Park
University of Illinois

Date submitted: 20 Sep 2006 Electronic form version 1.4