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Nano-Gap Embedded Plasmonic Gratings for Surface Plasmon Enhanced Fluorescence KUNAL BHATNAGAR, SANGHO BOK, VENUMADHAV KORAMPALLY, SHUBHRA GANGOPADHYAY, University of Missouri - Columbia, CENTER FOR NANO/MICRO SYSTEMS AND NANOTECHNOLOGY TEAM — Plasmonic nanostructures have been extensively used in the past few decades for applications in sub-wavelength optics, data storage, optoelectronic circuits, microscopy and bio-photonics. The enhanced electromagnetic field produced at the metal/dielectric interface by the excitation of surface plasmons via incident radiation can be used for signal enhancement in fluorescence and surface enhanced Raman scattering studies. Novel plasmonic structures on the sub wavelength scale have been shown to provide very efficient and extreme light concentration at the nano-scale. The enhanced electric field produced within a few hundred nanometers of these structures can be used to excite fluorophores in the surrounding environment. Fluorescence based bio-detection and bio-imaging are two of the most important tools in the life sciences. Improving the qualities and capabilities of fluorescence based detectors and imaging equipment has been a big challenge to the industry manufacturers. We report the novel fabrication of nano-gap embedded periodic grating substrates on the nanoscale using micro-contact printing and polymethylsilsesquioxane (PMSSQ) polymer. Fluorescence enhancement of up to 118 times was observed with these silver nanostructures in conjugation with Rhodamine-590 fluorescent dye. These substrates are ideal candidates for low-level fluorescence detection and single molecule imaging.

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