Supporting Information

Surfactant-Induced Modulation of Light Emission in Porous Silicon Produced by Metal-Assisted Electroless Etching

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Assessing the Effect of Residual Pt. Platinum patterns were deposited on p-Si using the FEI Dual Beam DB 235 system. The square checkered pattern was generated in Adobe Illustrator as a bitmap image with a defined number of pixels. The bitmap was then rendered by the FEI software for controlling the deposition parameters. Trimethylmethylcyclopentadienyl-Pt (C₉H₁₆Pt), TMCP-Pt, was volatilized at 40° C and used as the organometallic precursor in all depositions. TMCP-Pt was exposed to 30 kV Ga⁺ ions at currents varying from 1000 – 5000 pA with 2 µs dwell time at each pixel. Deposition conditions were fixed to achieve an ion flux of 2-6 pA/µm², equivalent to ~ 1- 4 x 10¹⁵ ions cm⁻² s⁻¹, for optimum film growth. To investigate the effects of changing ion dose, a checkered test pattern composed of 20 µm, 10 µm, 5 µm, 2.5 µm and 1.25 µm squares, created at constant ion flux, was examined. Auger analysis of the Pt deposited and etched samples were carried out using a Physical Electronics PHI 660 Scanning Auger Microscope. Far-field photoluminescence images were captured using a Leica TCS SP2.
Confocal and Multiphoton microscope equipped with UV, visible and near IR laser sources. In order to examine the luminescence from the samples, laser scanning confocal microscopy at 351 nm, or multiphoton microscopy using a mode-locked Ti sapphire laser operating at 780 nm, was used. To obtain an image by laser scanning confocal/multiphoton microscopy, a focused laser spot was scanned in X – Y to cover the region of interest on the sample, and data from each point was sent to a computer which was used to construct a digital image of the luminescence.

Microscopy of the etched samples revealed that, for the short etch times used in these studies, the etching was primarily confined to the areas of Pt deposition. Auger and scanning confocal luminescence images of a single pixel are shown in Fig. S1. The images are complementary in the sense that the areas which exhibit a strong Pt Auger signal are dark in the luminescence image, and the areas which show strong luminescence exhibit weak to little Pt signal in the Auger map. Scanning electron microscopy (not shown) illustrates that the Pt signal is associated with strong, local over-etching and the production of a deep crater within the single pixel.
The possible effect of residual Pt on the large scale features examined in the main body of the paper was further investigated by studying the luminescence behavior in the presence of 3-(N,N-dimethylmyristyl-ammonio)propanesulfonate, I, a zwitterionic surfactant. As shown in Fig. S2, there is a gradual loss in the photoluminescence intensity for samples immersed a pH 7 solution of surfactant I.

![Figure S2](image)

Figure S2. Integrated photoluminescence intensity from PSi samples exposed to a pH 7 solution of 100 µM 3-(N,N-dimethylmyristylammonio)propanesulfonate as a function of time. All the spectra are normalized to unit intensity at time $t = 0$. 

*Adsorbate-Induced Modulation of Light Emission in Porous Silicon....*