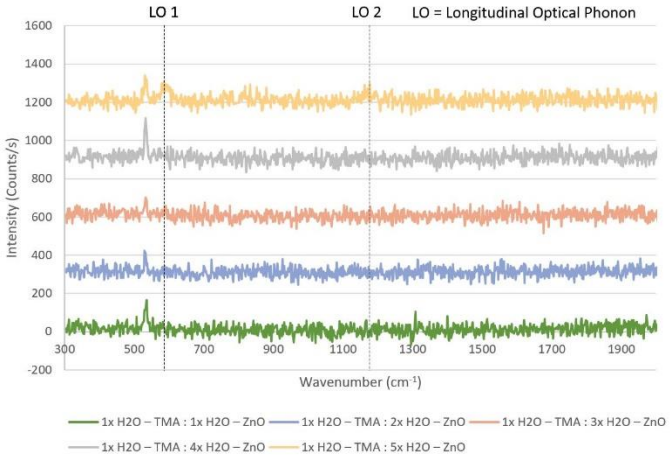

Figure 1: Raman Scattering of ZnO infiltrated PS-b-PMMA Cylinders with 1x TMA seed layer. Peaks at 530cm-1 indicate Raman peaks due to the SiO2 background. The first and second longitudinal optical phonons are located at 590 cm-1and 1185 cm-1, respectively. The absence of phonons in samples with less than five cycles of ZnO indicate isolated structures, and the absence of thin film structure. This means we can implement up to four cycles of ZnO and still have isolated nanostructures without bridging.

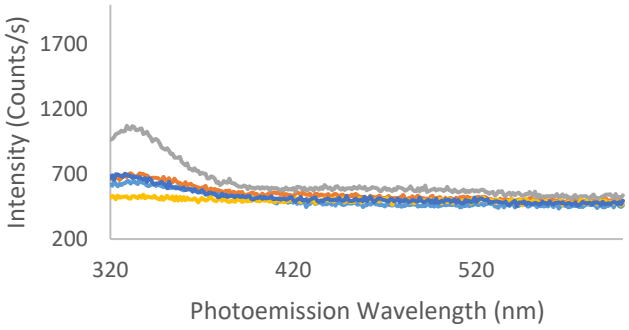

Figure 2: Photoluminescence of ZnO infiltrated cylindrical PS-b-PMMA without a seed layer as a function of growth. All photoemission occurs at 335nm (3.70eV), blue-shifted from bulk ZnO at 370nm(3.35eV). Peak intensity occurs after three cycles of ZnO. No Defect States are present

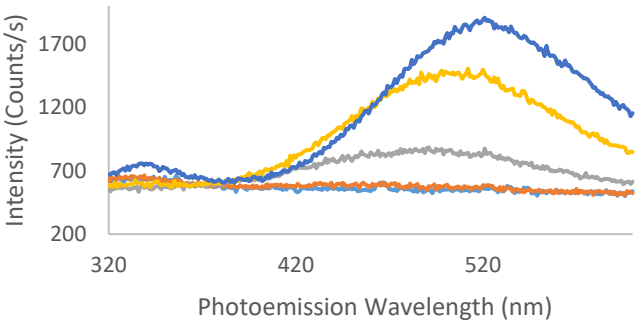

Figure 3: Photoluminescence of ZnO infiltrated cylindrical PS-b-PMMA with an alumina seed layer as a function of growth. Defect state photoemission is present at 520nm as well blue-shifted 335nm emission. Peak intensity occurs after five cycles of ZnO.

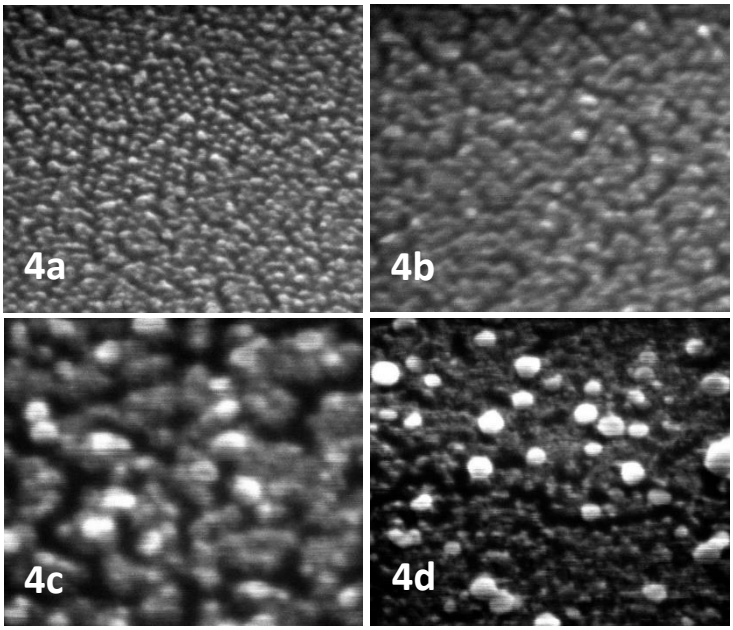

Figure 4: PS-b-PMMA with cylindrical morphology infiltrated with one cycle of Al_2O_3 and three cycles of ZnO after annealing in air at (a) 450 °C, (b) 500 °C, (c) 550 °C, and (d) 600 °C. Aggregation of nanostructures is apparent for samples annealed at 500 °C and higher. For samples annealed at 500 °C and higher, the nanostructures coalesce and form bulk ZnO

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