

Abstract Submitted  
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**Development of High Refractive Index Poly(thiophene) for 3-D Organic Photonic Crystals** STEPHEN CHENG, University of Akron, SHI JIN, CUNY, Staten Island, MATTHEW GRAHAM, University of Akron, TIMOTHY BUNNING, WPAFB Materials and Manufacturing Directorate — Currently, no polymers have a sufficiently high refractive index to open a complete photonic band gap (PBG) in the commonly used inverse opal structure. Poly(thiophene) (PT) is predicted to have a high enough refractive index, but experimental values have been significantly less than those predicted. To reconcile this discrepancy, the electropolymerization of thiophene has been optimized. The resulting poly(thiophene) (PT) films had improved structural regularity, and conjugation length. This translated into an elevated refractive index, as measured by Variable Angle Spectrographic Ellipsometry, which was sufficient to open a complete PBG. The next step to realizing an organic 3-D PC was to create high quality opal templates through which the PT could be polymerized. Colloidal crystallization of monodisperse spheres was used to fabricate the templates, while a novel nano-mechanical annealing technique was used to perfect the crystal structure. Taken together these developments offer the opportunity for the first time to make an organic 3-D PC with a complete PBG.

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