Supplementary Information for

All Nanoparticle-based P(MMA-AA)/TiO\textsubscript{2} One-dimensional Photonic Crystal Films with Tunable Structural Colors

Lin Wang\textsuperscript{a}, Shufen Zhang\textsuperscript{a}, Jodie L. Lutkenhaus\textsuperscript{b,c}, Lin Chu\textsuperscript{a}, Bingtao Tang\textsuperscript{a}, Shuang Li\textsuperscript{a} and Wei Ma\textsuperscript{a}\textasteriskcentered

\textsuperscript{a}State Key Laboratory of Fine Chemicals, Dalian University of Technology, Dalian, Liaoning 116023, P. R. China.
\textsuperscript{b}Artie McFerrin Department of Chemical Engineering and \textsuperscript{c}Department of Materials Science and Engineering, Texas A&M University, College Station, Texas 77843, United States.
\textsuperscript{*}E-mail: maryweima@163.com; Tel: +86-411-84986506.

\textbf{Figure S1.} XRD Patterns of titania. The XRD pattern shows that the titania is an anatase phase.

\textbf{Figure S2.} a) Refractive index of TiO\textsubscript{2}, b) Refractive index of P(MMA-AA). In this case, the average refractive indexes of the polymer and titania layers were 1.31 and 2.15, respectively in the visible light region (400 nm-800 nm).
Figure S3. FESEM images of TiO$_2$ and P(MMA-AA) nanoparticles.

Figure S4. a) FTIR spectra of P(MMA-AA) and PMMA, b) The enlarged FTIR spectra of P(MMA-AA) and PMMA. As it is shown, there is a little difference in the FTIR spectra of PMMA and P(MMA-AA) (Figure S2a)). A vibration peak of hydroxyl stretching around 3300 cm$^{-1}$ appears in the enlarged FTIR spectra of P(MMA-AA) (Figure S2b)), indicating acrylic acid (AA) monomer have been copolymerized with MMA.

Figure S5. a) Color variation, b) Reflectance spectra and c) CIE 1931 chromaticity coordinates of the 1DPCs with different spin coating times. As shown above, the maximum reflectance wavelength of the 1DPC films red-shifts with the increase of spinning-coating times of TiO$_2$. 

Figure S6. a) Color variation b) Reflectance spectra and c) CIE 1931 chromaticity coordinates of the 1DPCs with different spinning-coating speed. We can easily find that the maximum reflectance wavelength of the 1DPC films blue-shifts with the increase of TiO$_2$ assembly speed.