Low Temperature Fabrication of Mesoporous Titanium Dioxide Thin Films with Tunable Refractive Index for 1-D Photonic Crystals and Sensors on Rigid and Flexible Substrates

Cheng Li †, Nicholas S. Colella †, James J. Watkins †*

†Department of Polymer Science and Engineering, University of Massachusetts Amherst, 120 Governors Drive, Amherst, Massachusetts 01003, United States

*E-mail: watkins@polysci.umass.edu

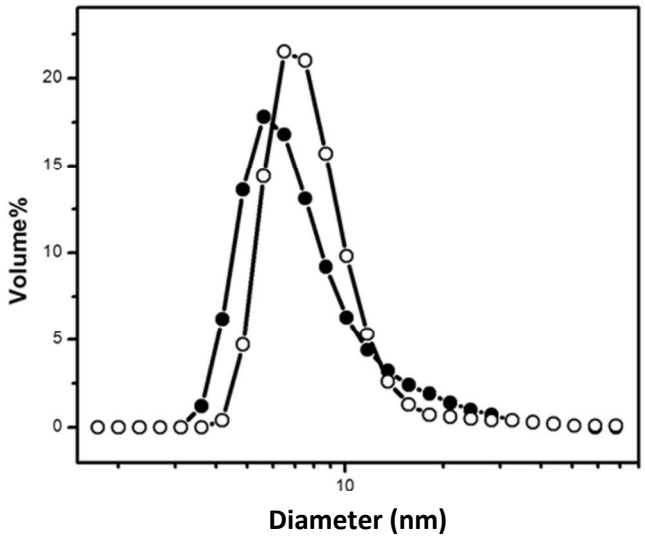


Figure.S1 Size distribution of TiO_2 nanoparticles in water (white circle) and NMP/MeOH (black circle)

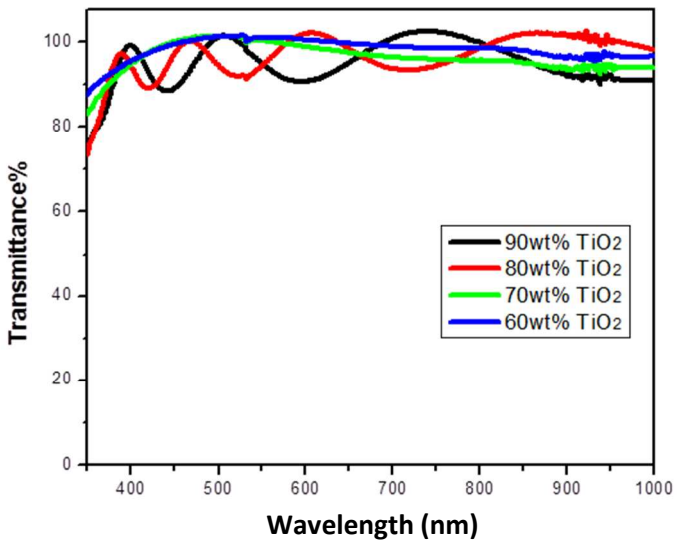


Figure.S2 UV-Vis spectrum of TiO_2/NOA65 hybrid films

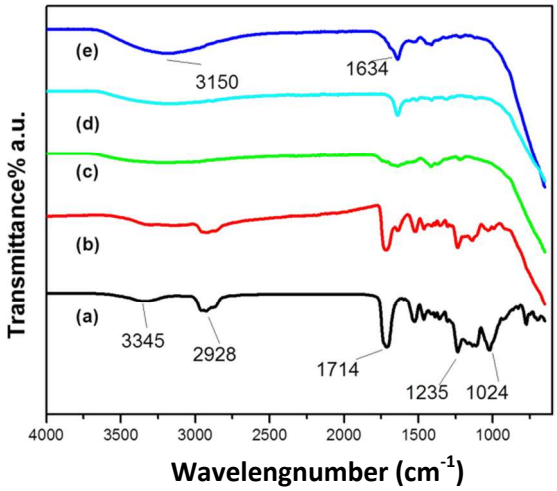
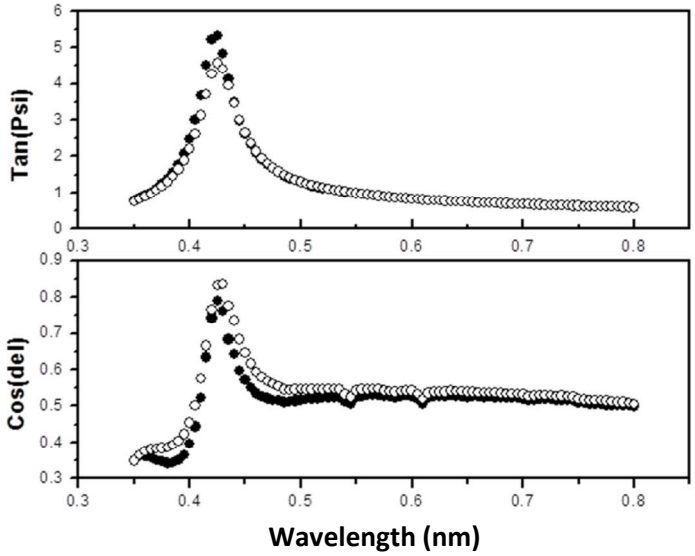
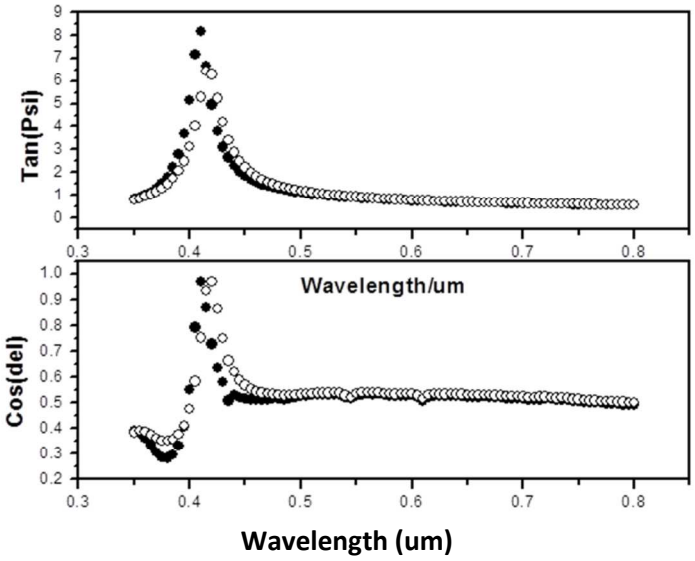


Figure.S3 FTIR spectrum of NOA65(a), 60wt%TiO2/40wt%NOA65(b), 60wt%TiO2/40wt%NOA65 after UV radiation at room temperature for three hours(c), 60wt%TiO2/40wt%NOA65 after sufficient UV radiation at 65 ^{o}C for one hour(d) TiO2 nanoparticles(e).



(a)



(b)

Figure.S4 Ellipsometry data of T60 films before(black solid) and after(black circle) treating with heating(a) and ultra-sonication in water(b) .

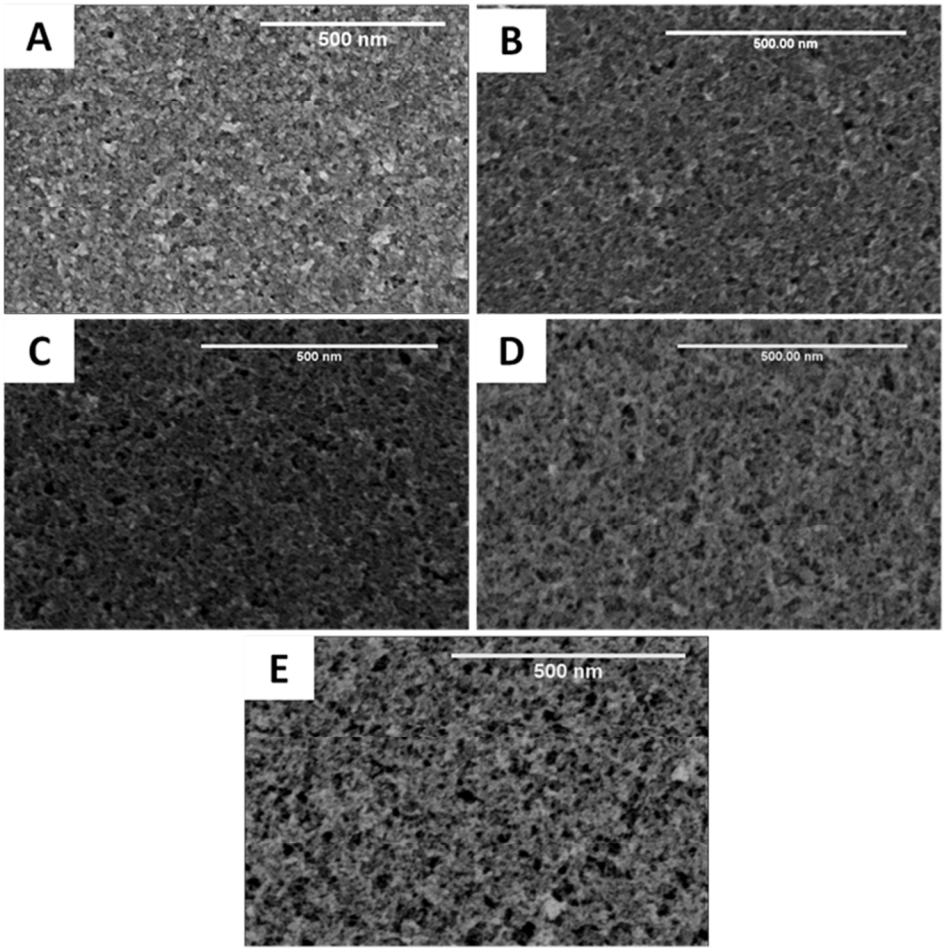


Figure.S5 SEM image of T100(a), T90(b), T70(c), T60(d), T50(e)

Table.S1 Thickness and refractive index at 600nm of T60 samples before and after heating and sonication treatment in different solvents

	Thickness as casting	Thickness after treatment	Refractive index as casting	Refractive index after treatment
Heating	80.2nm	81.0nm	1.54	1.54
Water	79.6nm	78.8nm	1.53	1.54
NMP/MeOH	82.3nm	82.6nm	1.54	1.54
IPA	80.7nm	80.1nm	1.53	1.54
DMF	72.0nm	72.9nm	1.54	1.54

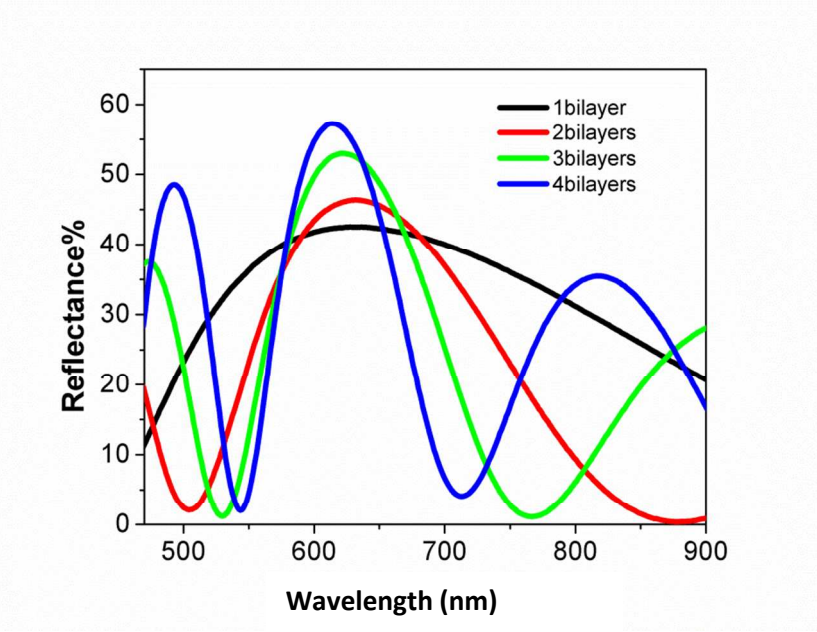


Figure S6 Reflectance measurement of a Bragg mirror sample with different layer number

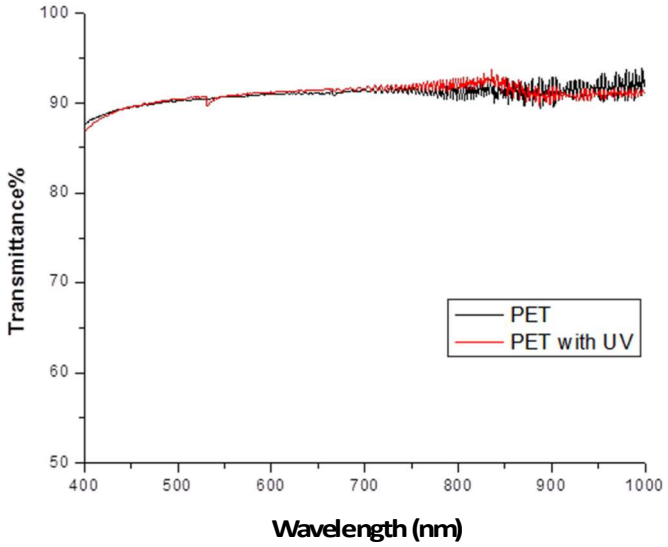


Figure.S7 UV-Vis of PET substrate and UV exposed PET substrate

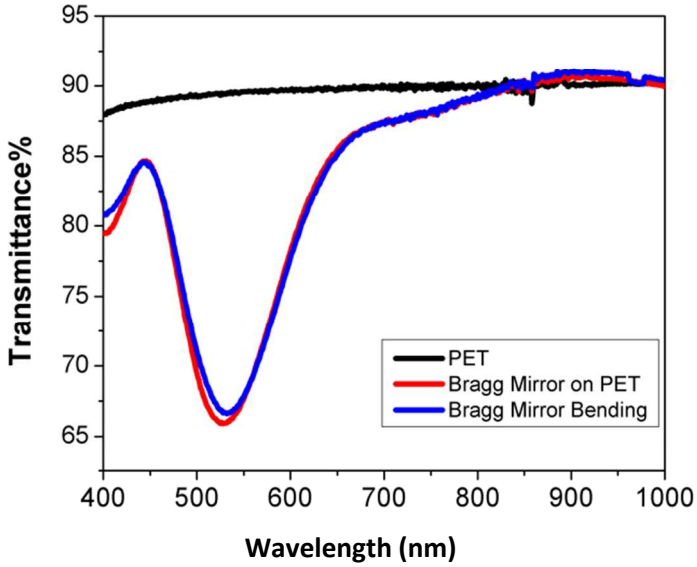


Figure.S8 Transmittance of a mesoporous TiO_2 Bragg mirror on PET before and after bending for 100 times.

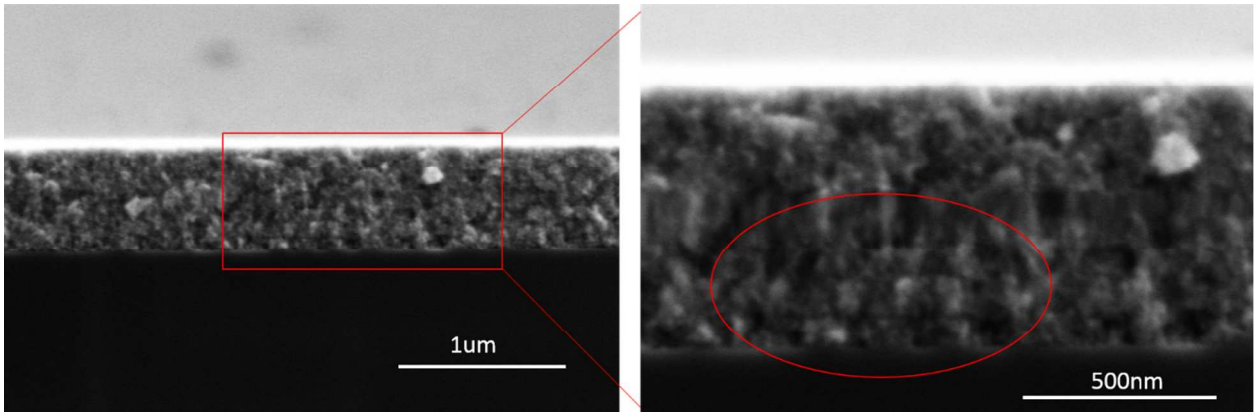


Figure S9. SEM image of a mesoporous TiO2 Bragg mirror on PET substrate. Sample was coated with gold to increase conductivity.