Supporting Information Core-Shell, Defective TiO₂ Nanoparticles by Femtosecond Laser Irradiation with Enhanced Photocatalytic Performance

Bersu Bastug Azer^{a,b,*}, Ahmet Gulsaran^{a,b}, Joel R. Pennings^{a,b}, Reza Karimi^c, Aydin Ashrafi Belgabad^{d,c}, Alexander H. Xu^{e,b}, Liena Zaidan^f, Samed Kocer^{g,b}, Joseph Sanderson^c, Michal Bajcsy^{f,h}, Michael A. Pope^{i,b}, Mustafa Yavuz^{a,b,*}

- ^a Department of Mechanical and Mechatronics Engineering, University of Waterloo, 200 University Ave. West, Waterloo, ON N2L 3G1, Canada
- ^b Waterloo Institute for Nanotechnology (WIN), University of Waterloo, 200 University Ave.
 West, Waterloo, ON N2L 3G1, Canada
- ^c Department of Physics and Astronomy, University of Waterloo, 200 University Ave. West, Waterloo, ON N2L 3G1, Canada
- ^d Department of Physics and Energy Engineering, Amirkabir University of Technology (Tehran Polytechnic), P.O. Box 15875-4413, Tehran, Iran.
- ^e Department of Nanotechnology Engineering, University of Waterloo, 200 University Ave.
 West, Waterloo, ON N2L 3G1, Canada
- ^f Department of Electrical and Computer Engineering, University of Waterloo, 200 University Ave. West, Waterloo, ON N2L 3G1, Canada

- ^g Department of Systems Design Engineering, University of Waterloo, 200 University Ave. West, Waterloo, ON N2L 3G1, Canada
- ^h Institute for Quantum Computing, University of Waterloo, 200 University Ave. West, Waterloo, ON N2L 3G1, Canada
- ⁱ Department of Chemical Engineering, University of Waterloo, 200 University Ave. West, Waterloo, ON N2L 3G1, Canada
- * Corresponding authors. E-mail addresses: <u>bbastuga@uwaterloo.ca</u> (B. Bastug Azer); <u>myavuz@uwaterloo.ca</u> (M. Yavuz)



Figure S1. Spectrum of the femtosecond laser (a) before BBO crystal and (b) after BBO crystal. The insets show the spectrum of the second harmonic blue light (upper) and the IR light (below)



Figure S2. O1s XPS spectra of untreated TiO_2 , TiO_2 -15, TiO_2 -30, TiO_2 -60, TiO_2 -90 and TiO_2 -120.



Figure S3. VB XPS spectra of untreated TiO₂, TiO₂-15, TiO₂-30, TiO₂-60, TiO₂-90 and TiO₂-120.