

Photocatalytic degradation of imidazolium ionic liquids using dye sensitized TiO₂/SiO₂ composites

Lirong Huang,^a Yinghao Yu,^{a,} Chao Fu,^b Haiyang Guo^a and Xuehui Li^a*

^aSchool of Chemistry and Chemical Engineering, South China University of Technology, Guangzhou 510641, China.

^bSINTEF Energy Research, 7465 Trondheim, Norway.

Table S1. Textural properties of SBA-15, X% TiO₂/SiO₂ and DCQ-X% TiO₂/SiO₂ samples.

Samples	S_{BET} (m ² /g)	D_{BJH} (Å)	V_{meso} (cm ³ /g)
SBA-15	827.7	70.2	1.21
10% TiO ₂ /SiO ₂	836.9	59.7	1.00
20% TiO ₂ /SiO ₂	691.3	51.4	0.82
30% TiO ₂ /SiO ₂	612.7	51.4	0.75
40% TiO ₂ /SiO ₂	525.3	51.7	0.74
DCQ-10% TiO ₂ /SiO ₂	823.7	58.3	1.04
DCQ-20% TiO ₂ /SiO ₂	701.0	53.5	0.86
DCQ-30% TiO ₂ /SiO ₂	608.2	51.2	0.80
DCQ-40% TiO ₂ /SiO ₂	496.6	50.8	0.73

Table S2. FT-IR bands and their corresponding assignments

Wavenumber (cm ⁻¹)	Assignments
1636	Stretching vibration of -OH of Si-OH or Ti-OH ^{27,28}
1550	Skeletal vibration of C=C bonds of aromatic rings in DCQ
1469	Bending vibration of C-H in DCQ
1339	Stretching vibration of C-N in DCQ
1086	Asymmetric stretching vibration of Si-O-Si ^{27,28,35}
960	Stretching vibration of Si-O-Ti ^{27,28,35}
801	Symmetric stretching vibration of Si-O-Si ^{27,28,35}
465	Deformation of Si-O-Si ^{27,28}

Table S3. Estimated E_g values for TiO₂, X% TiO₂/SBA-15 and DCQ-X% TiO₂/SBA-15

Samples	Estimated E_g (ev)	Samples	Estimated E_g (ev)
TiO ₂	3.29	-	-
10% TiO ₂ /SiO ₂	3.21	DCQ-10% TiO ₂ /SiO ₂	3.10
20% TiO ₂ /SiO ₂	3.20	DCQ-20% TiO ₂ /SiO ₂	3.07
30% TiO ₂ /SiO ₂	3.17	DCQ-30% TiO ₂ /SiO ₂	3.07
40% TiO ₂ /SiO ₂	3.17	DCQ-40% TiO ₂ /SiO ₂	3.07

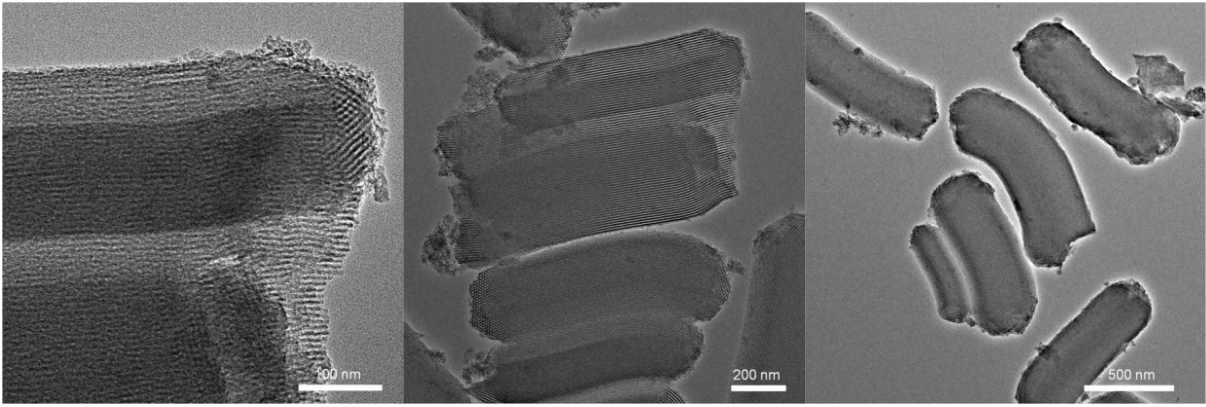


Figure S1 TEM images of SBA-15

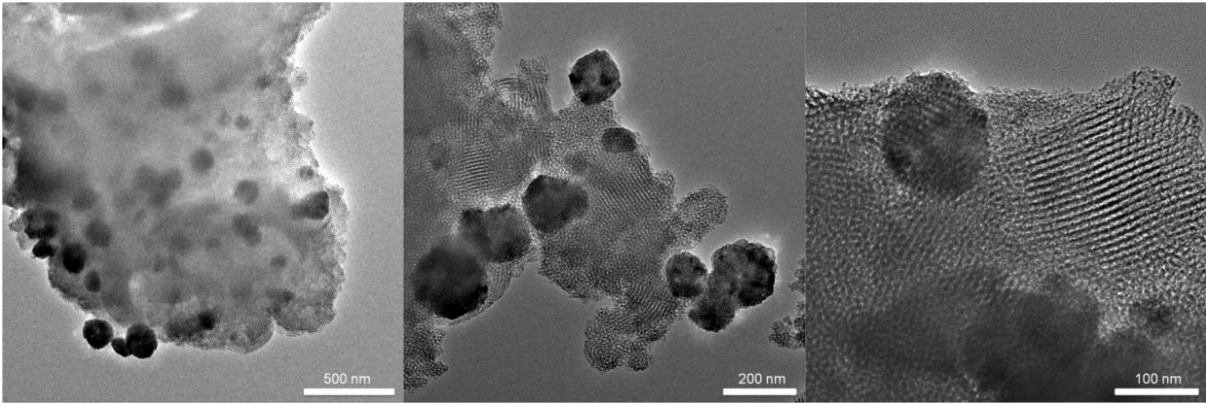


Figure S2 TEM images of 10% TiO₂/SiO₂

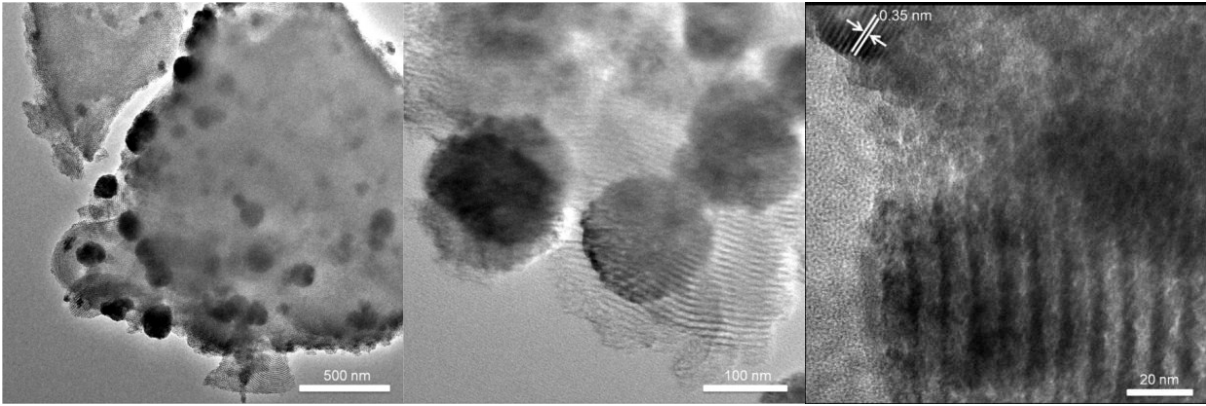


Figure. S3 TEM images of DCQ-10% TiO₂/SiO₂

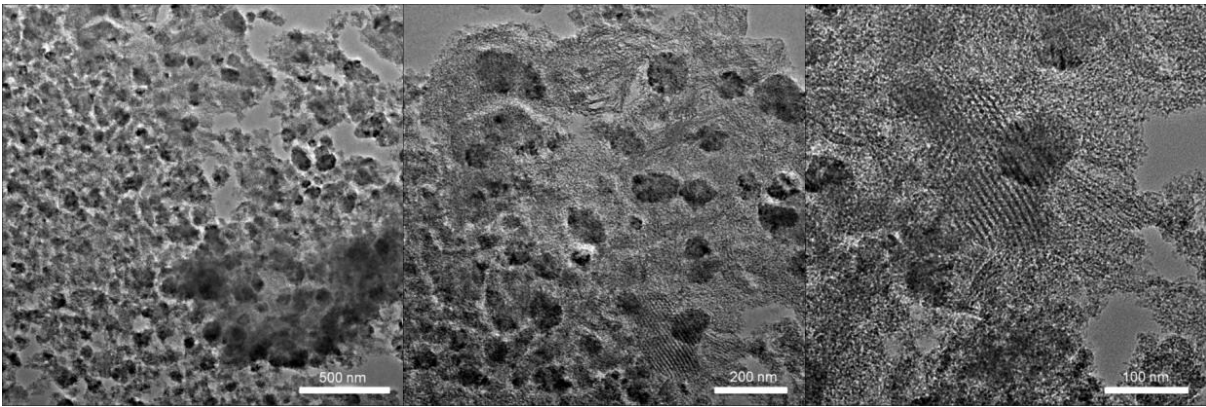


Figure S4 TEM images of 20% TiO₂/SiO₂

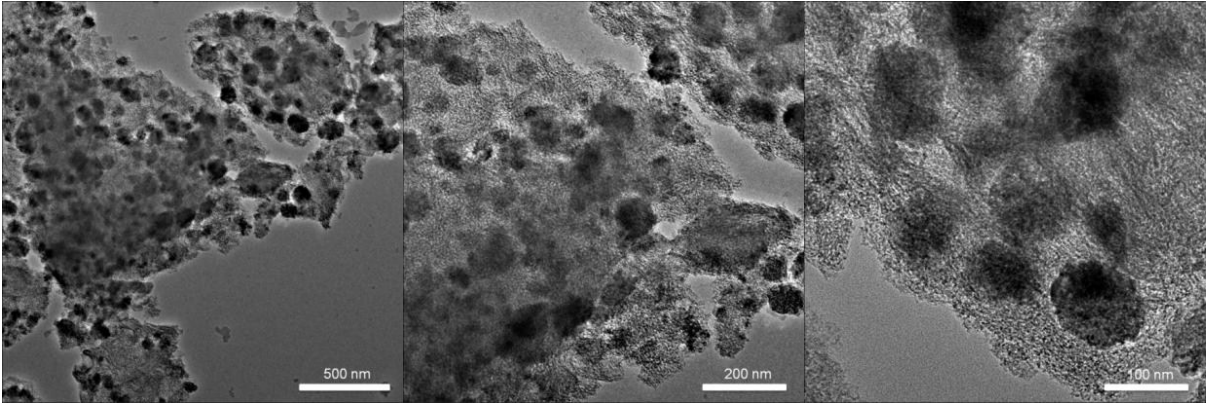


Figure S5 TEM images of DCQ-20% TiO₂/SiO₂

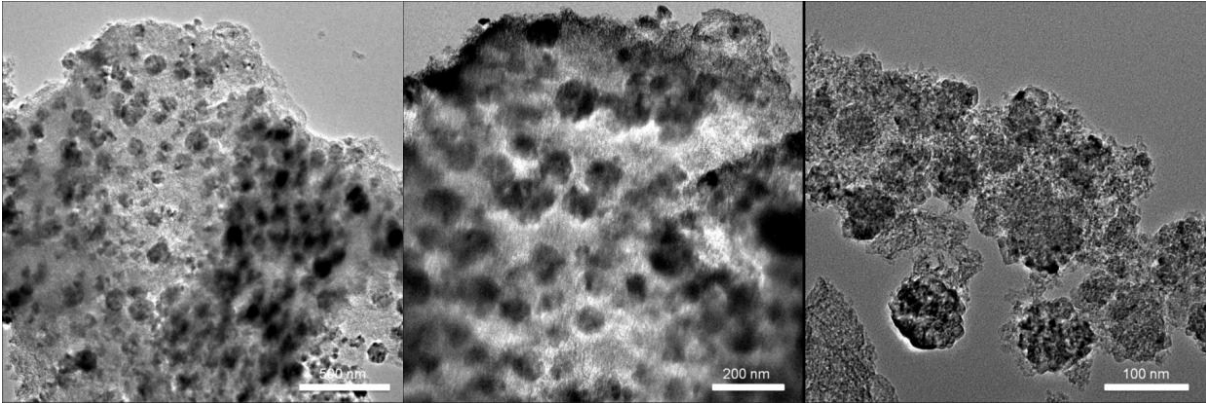


Figure S6 TEM images of 30% TiO₂/SiO₂

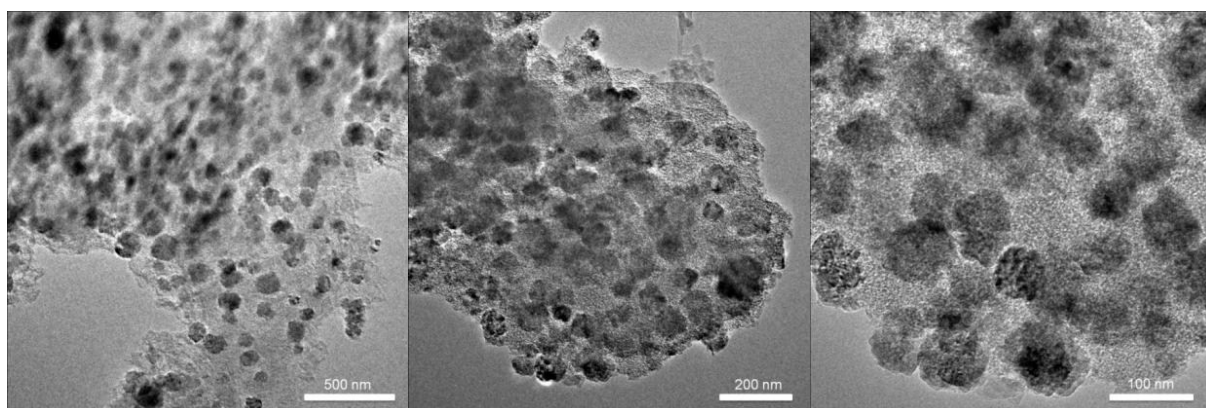


Figure S7 TEM images of DCQ-30% TiO₂/SiO₂

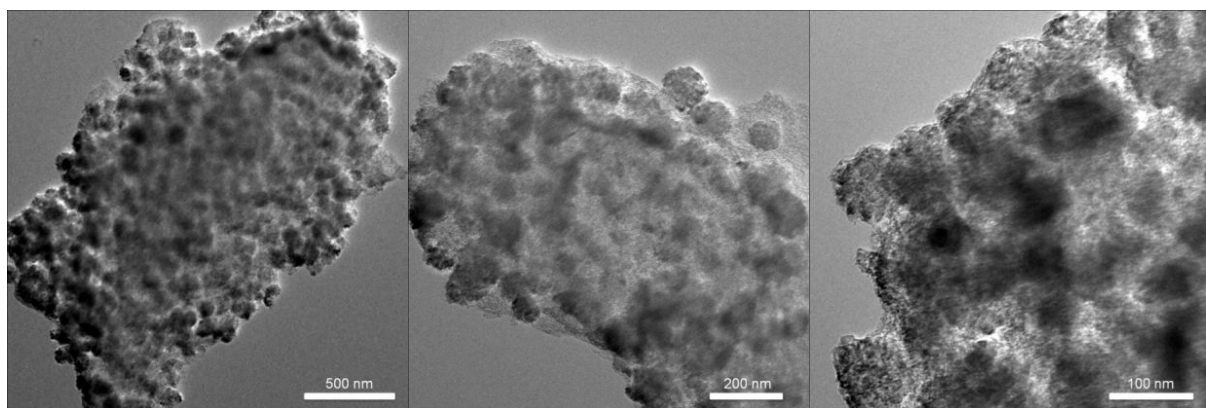


Figure S8 TEM images of 40% TiO₂/SiO₂

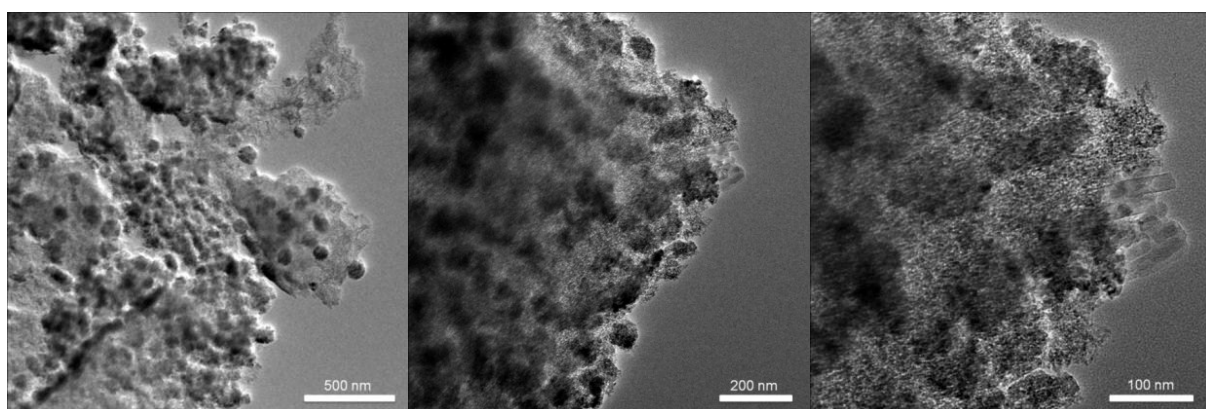


Figure S9 TEM images of DCQ-40% TiO₂/SiO₂

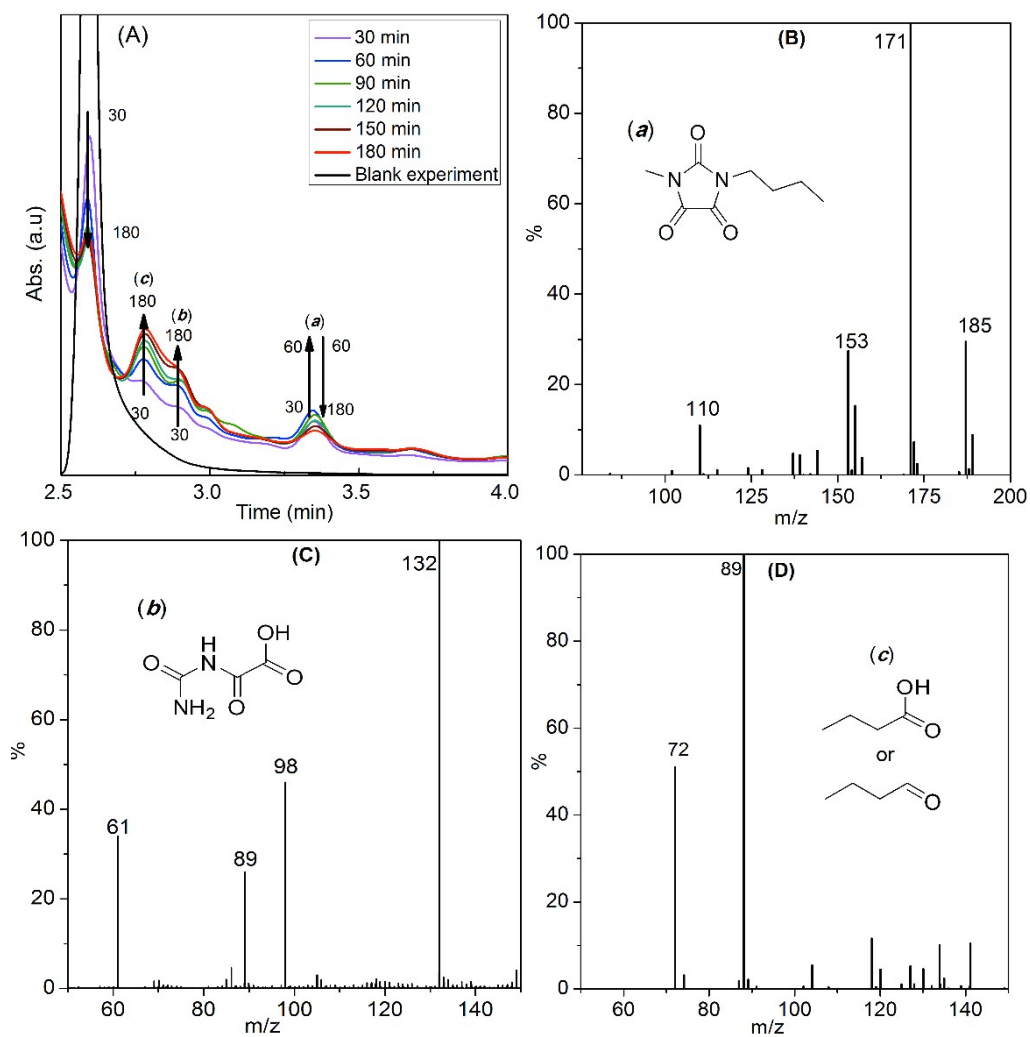
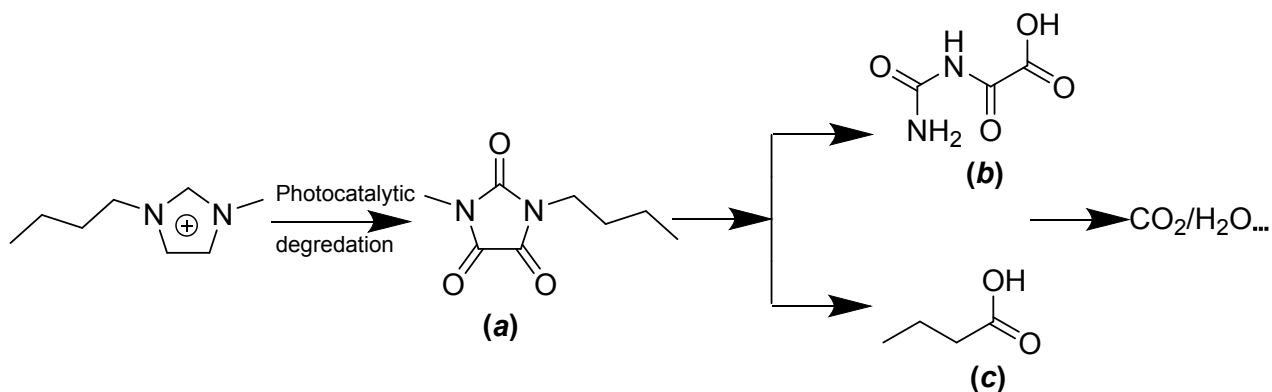


Figure S10. (A) HPLC of [BMIM]⁺ degradation over DCQ-30% TiO₂/SiO₂ under simulated solar irradiation; (B, C and D) mass spectra and the corresponding structures of the intermediates (a), (b), (c).



Scheme S1 Proposed pathways of [BMIM]⁺ in the photocatalytic degradation.