Supporting Information

Scandium Ion-Promoted Photoinduced Electron Transfer from Electron Donors to Acridine and Pyrene. Essential Role of Scandium Ion in Photocatalytic Oxygenation of Hexamethylbenzene

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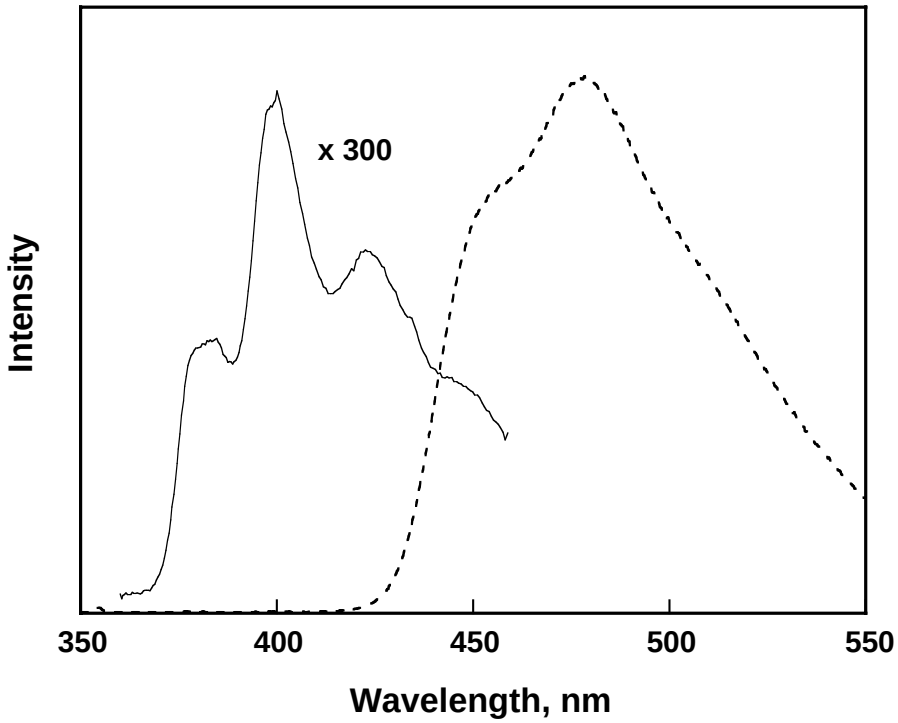

Figure S1. Fluorescence spectra of acridine (AcrN) (3.5×10^{-5} M) in the absence (solid line) and in the presence of $Sc(OTf)_3$ (2.0×10^{-3} M, dashed line) in deaerated MeCN at 298 K.

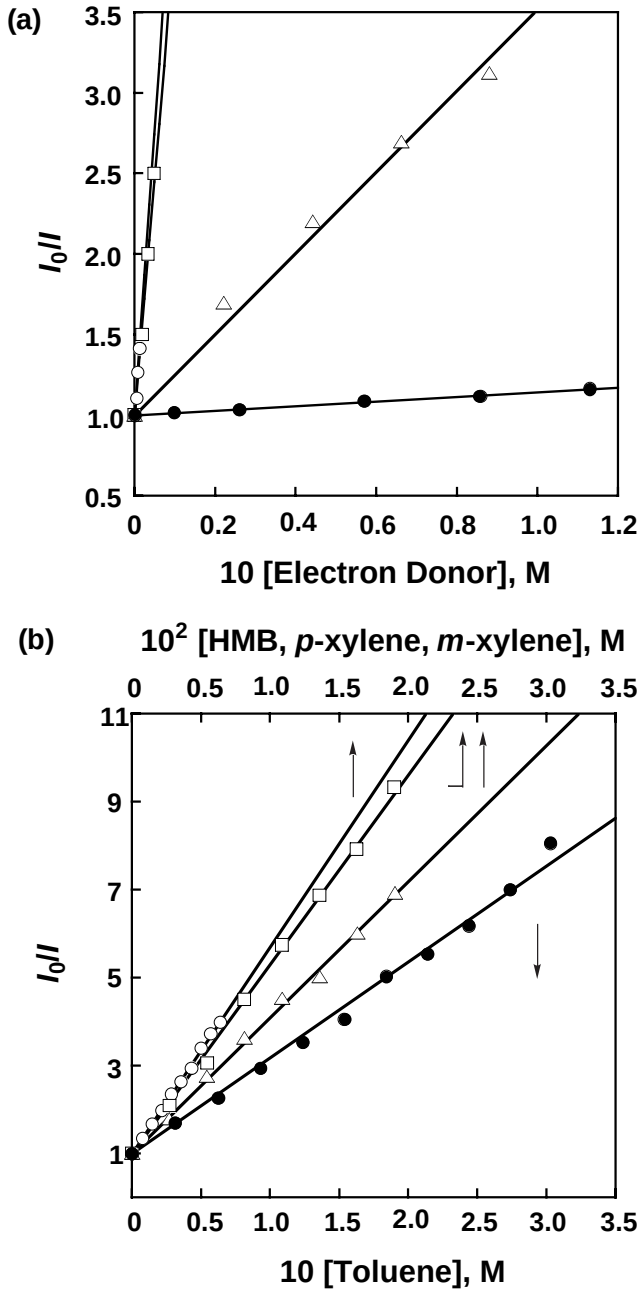

Figure S2. Stern-Volmer plots for the fluorescence quenching of AcrN (1.0×10^{-4} M) by (a) 1,1'-dimethylferrocene (○), 10-methyl-9,10-dihydroacridine (□), 1,2,4-trimethoxybenzene (△) and 1,4-dimethoxybenzene (●) in deaerated MeCN at 298 K and (b) hexamethylbenzene (HMB; ○), *p*-xylene (□), *m*-xylene (△), and toluene (●) in the presence of $Sc(OTf)_3$ (4.0×10^{-2} M) in deaerated MeCN at 298 K.

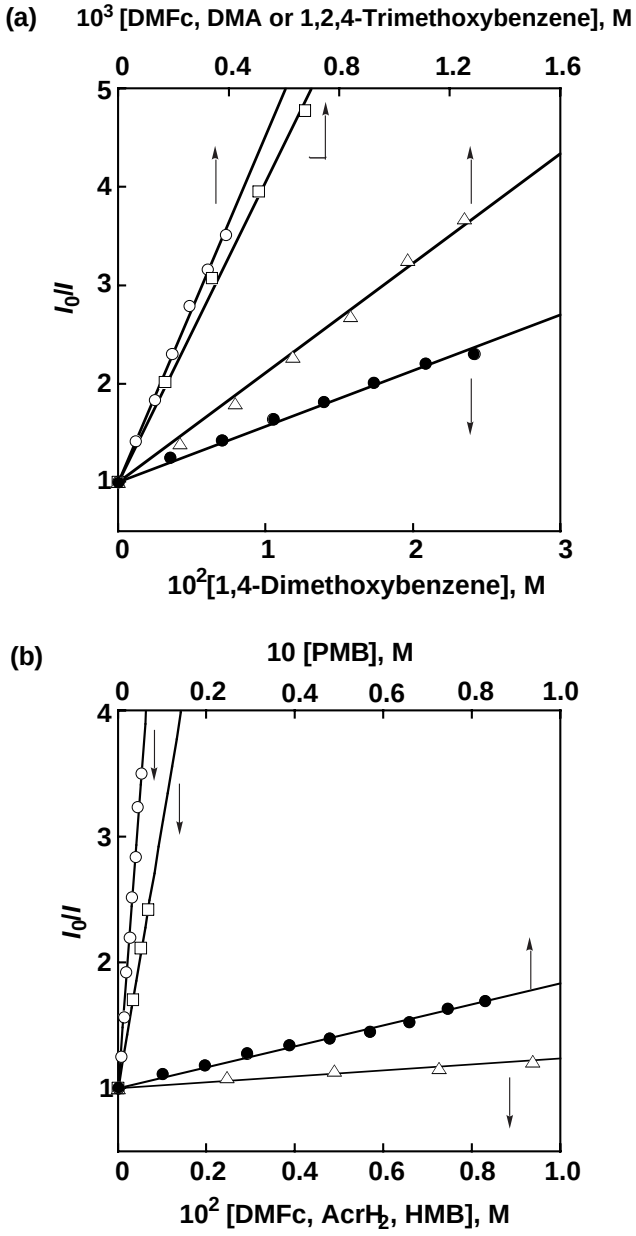

Figure S3. Stern-Volmer plots for the fluorescence quenching of Py (1.3×10^{-6} M) by (a) 1,1'-dimethylferrocene (DMFc, ○), *N*,*N*-dimethylaniline (DMA, □), 1,2,4-trimethoxybenzene (△) and 1,4-dimethoxybenzene (●) in deaerated MeCN at 298 K and (b) 1,1'-dimethylferrocene (○), 10-methyl-9,10-dihydroacridine ($AcrH_2$, □), hexamethylbenzene (HMB, △) and pentamethylbenzene (PMB, ●) in the presence of $Sc(OTf)_3$ (4.0×10^{-2} M) in deaerated MeCN at 298 K.

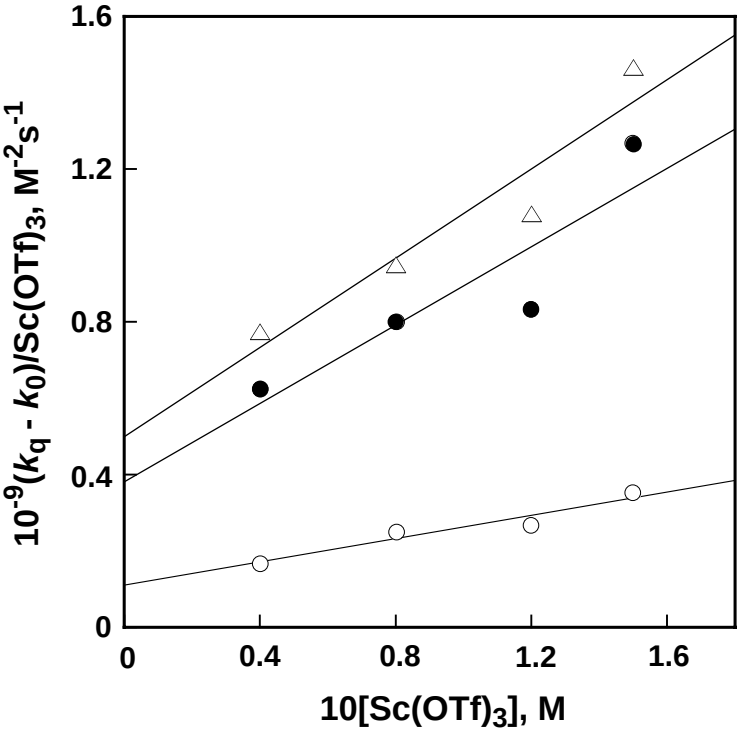

Figure S4. Plots of $(k_q–k_0)/[Sc(OTf)_3]$ vs $[Sc(OTf)_3]$ for the fluorescence quenching of Py (1.3×10^{-6} M) by 1,2,3,5–tetramethylbenzene (○), 1,2,4,5–tetramethylbenzene (●) and pentamethylbenzene (△) in the presence of $Sc(OTf)_3$ in deaerated MeCN at 298 K.

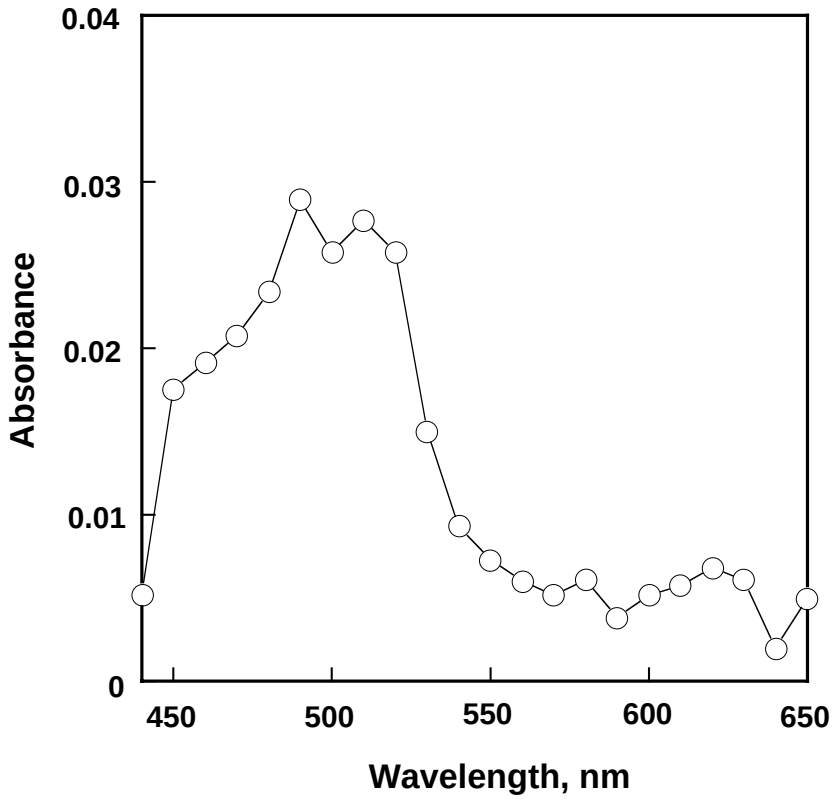

Figure S5. Transient absorption spectrum in the photoreduction of AcrN (6.6×10^{-5} M) by ferrocene (1.2×10^{-2} M) in the presence of $Sc(OTf)_3$ (9.7×10^{-3} M) at 1μs after laser irradiation at λ = 355 nm in deaerated MeCN at 298 K.

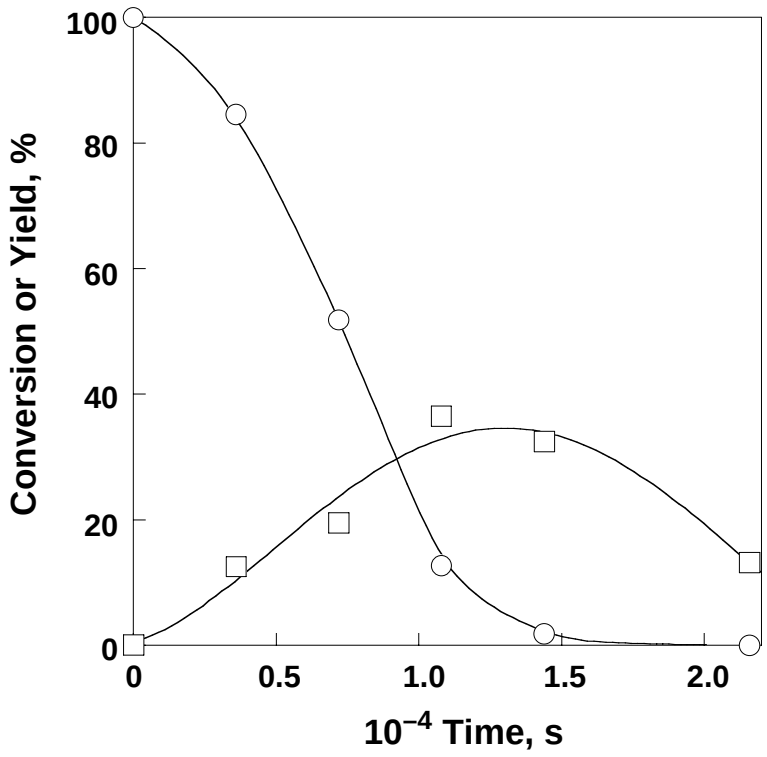

Figure S6. Plots of the conversion of HMB (○) and the yield of pentamethylbenzyl alcohol (□) vs time determined based on the ^{1}H-NMR spectral change observed in the photosensitized oxygenation of HMB (2.0×10^{-3} M) in the presence of Py (2.0×10^{-5} M) and $Sc(OTf)_3$ (4.0×10^{-2} M) under irradiation of UV-visible light ($\lambda > 300$ nm) in O_2-saturated MeCN at 298 K.

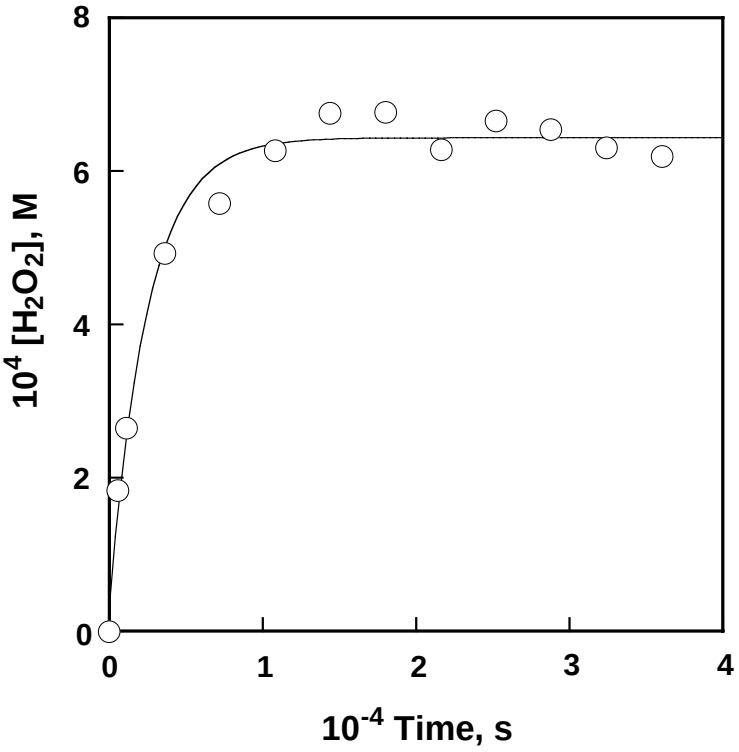

Figure S7. Plot of concentration of hydrogen peroxide vs reaction time in the photosensitized oxygenation of HMB (2.0×10^{-3} M) in the presence of AcrN (2.0×10^{-5} M) and $Sc(OTf)_3$ (4.0×10^{-2} M) under irradiation of UV-visible light ($\lambda > 300$ nm) in O_2-saturated MeCN at 298 K.