Electronic Supplementary Information (ESI)

Oxidation of pollutants by electro Fenton-like process in aqueous media using iron-zeolite modified electrodes

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Table S1. Physicochemical characterization data acquired through N_2 adsorption-desorption and X-ray diffraction (XRD). Textural properties (specific surface area, pore volume, BJH pore diameter) of the samples.

		ZSM-5	Fe(II)ZSM-5	$Fe(II)_{TT}$ZSM-5	Fe(III)ZSM-5	$Fe(III)_{TT}$ZSM-5
N_2 adsorption	S_{BET} ($m^2\ g^{-1}$)[a]	411	335	374	413	421
	$S_{ext.}$ ($m^2\ g^{-1}$)[c]	169	113	135	133	152
	V_{total} ($cm^3\ g^{-1}$)[d]	0.26	0.22	0.22	0.27	0.27
	V_{meso} ($cm^3\ g^{-1}$)[e]	0.16	0.12	0.12	0.15	0.15
	V_{micro} ($cm^3\ g^{-1}$)[f]	0.10	0.10	0.10	0.12	0.12
	V_{micro}/V_{total} (%)[g]	38.5	45.4	45.4	44.4	44.4
	S_{meso}/S_{BET} (%)[h]	41.1	33.7	36.1	32.2	36.1
	V_{meso}/V_{micro}[i]	1.60	1.20	1.20	1.25	1.25
	$Ø_{BJH\text{-}ads}$ (nm)[j]	4.14	4.14	4.14	4.16	4.14
XRD	Relative crystallinity (%)[k]	100	85	83	85	84
	Average size of crystallites (nm)[l]	13	11	10	11	11

[a]BET surface area; [b]t-plot micropore area; [c]External surface area; [d]Total pore volume; [e]Mesoporous volume; [f]Microporous volume; [g]Ratio of micropore and total volumes; [h]Ratio of mesopore and BET surface area; [h]Ratio of mesopore and micropore volumes; [j]BJH pore diameter; [k]Relative crystallinity (%) determined by ASTM D 5758; [l]Average size of crystallites determined by Scherrer equation.

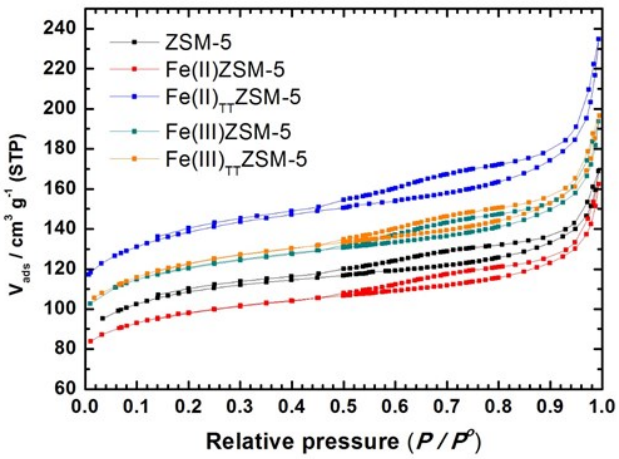

Figure S1- Nitrogen physisorption isotherms of (■) ZSM-5, (■) Fe(II)ZSM-5, (■) Fe(II)$_{TT}$ZSM-5, (■) Fe(III)ZSM-5 and (■) Fe(III)$_{TT}$ZSM-5.

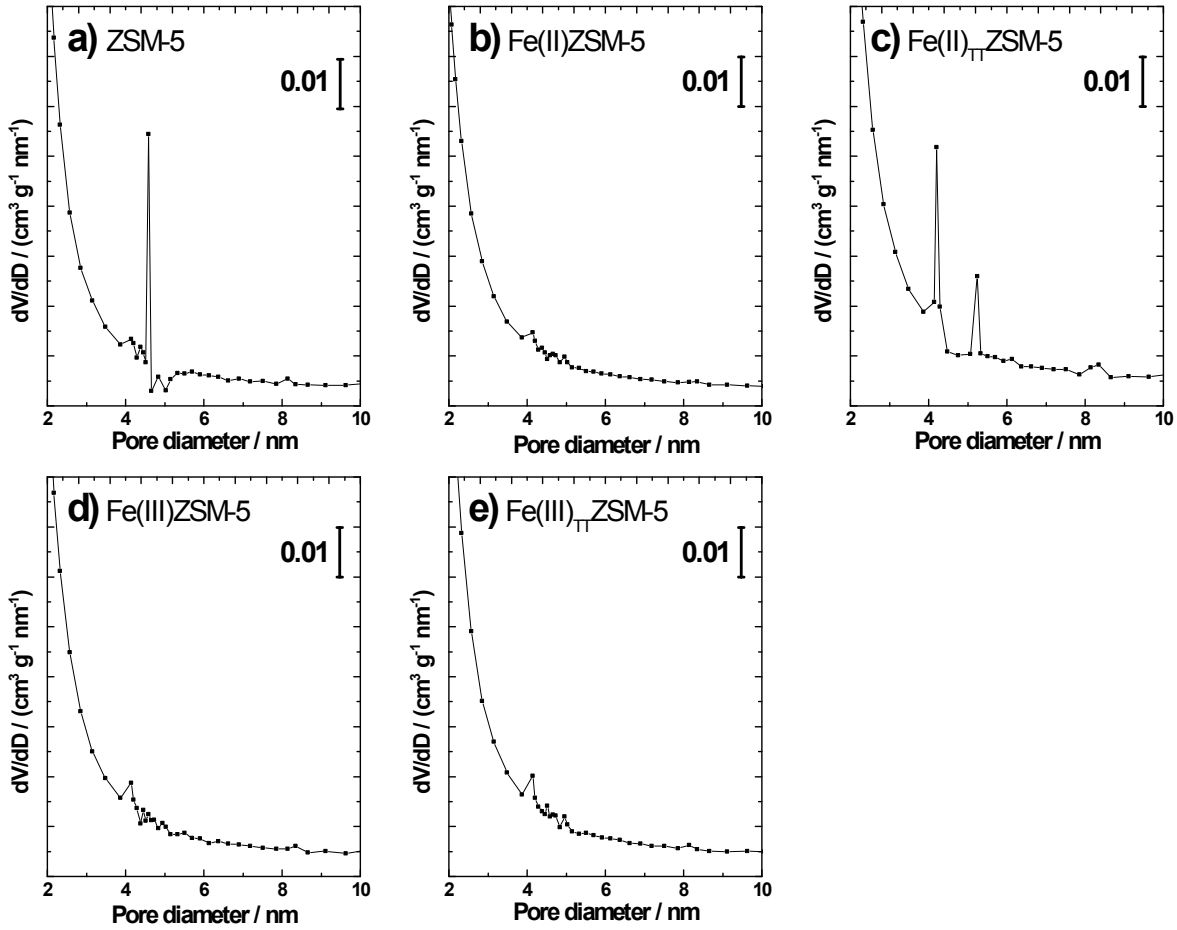

Figure S2. BJH pore size distributions of: a) ZSM-5, b) Fe(II)ZSM-5, c) Fe(II)$_{TT}$ZSM-5, d) Fe(III)ZSM-5 and e) Fe(III)$_{TT}$ZSM-5.

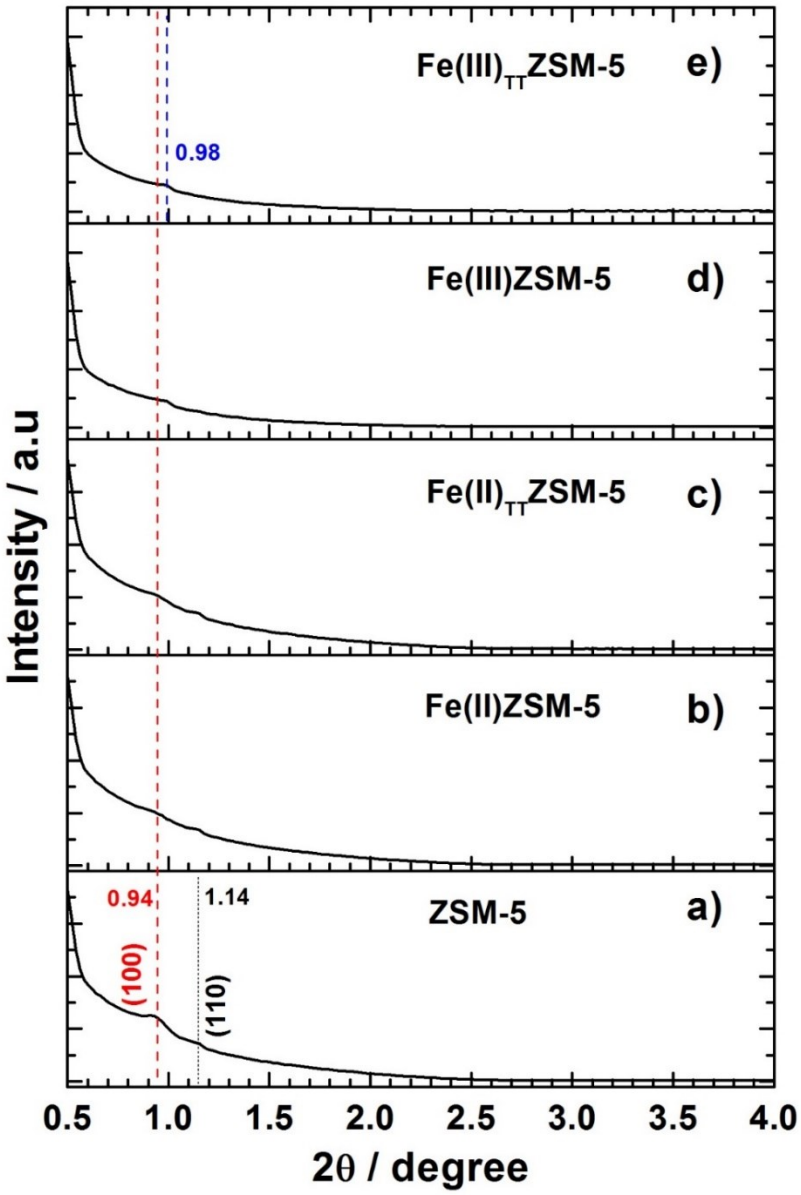

Figure S3. Low-angle XRD patterns of the a) ZSM-5, b) Fe(II)ZSM-5, c) Fe(II)$_{TT}$ZSM-5, d) Fe(III)ZSM-5 and e) Fe(III)$_{TT}$ZSM-5.

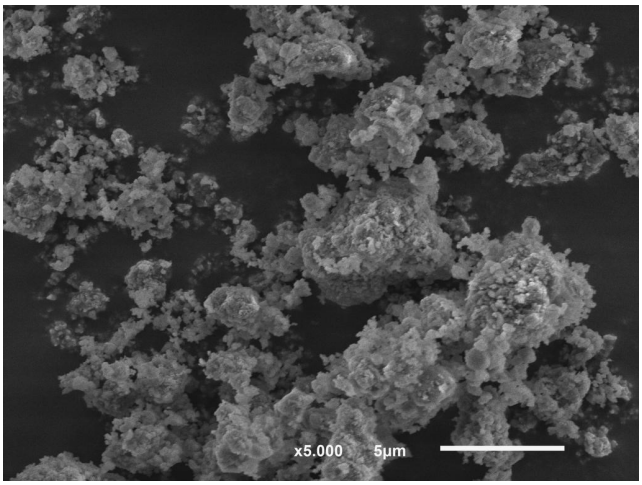

Figure S4. Representative SEM image of Fe(III)ZSM-5 with a scale bar of 5 µm.

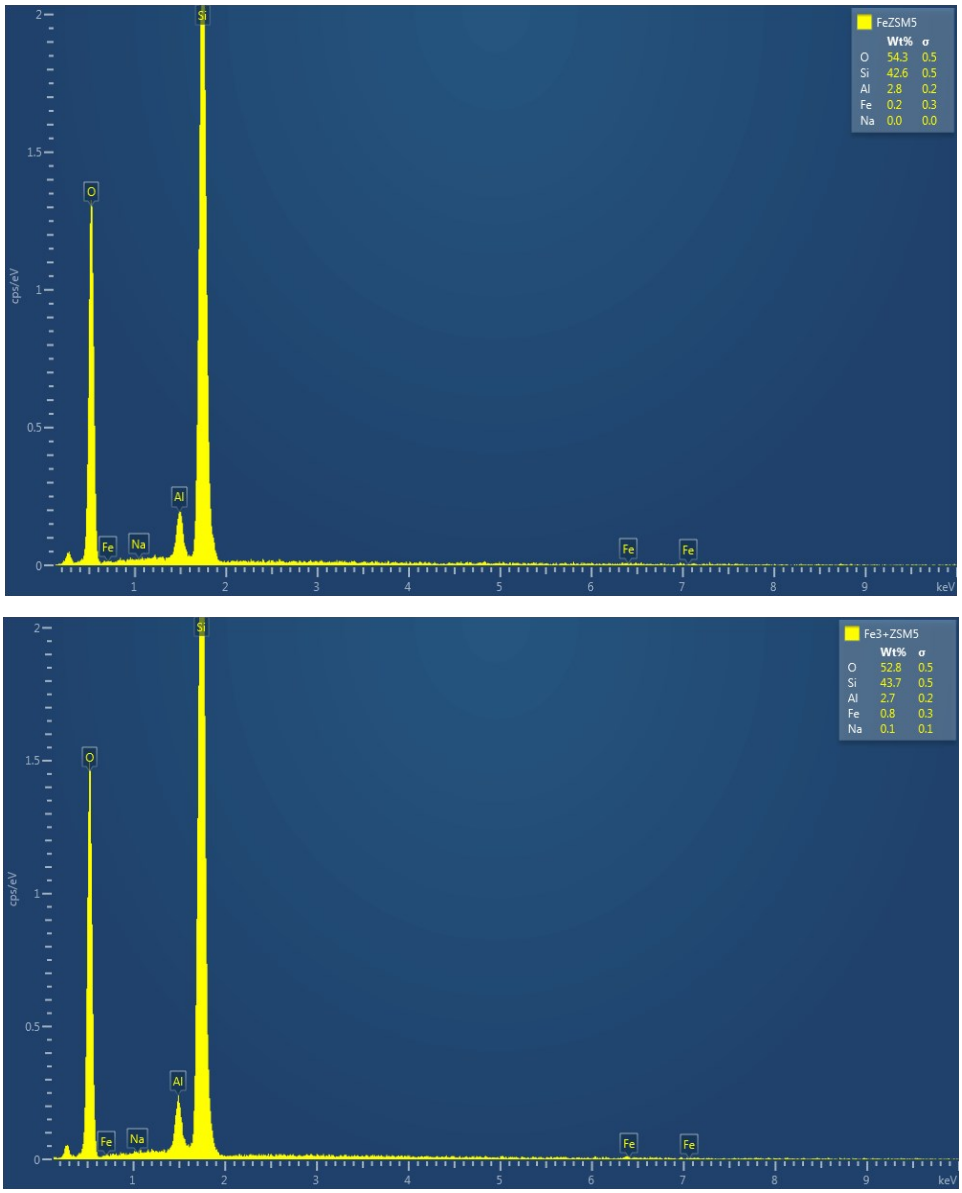

Figure S5. EDX spectra of Fe(II)$_{TT}$ZSM-5 and Fe(III)$_{TT}$ZSM-5.

Table S2. Elemental analysis from EDX measurements of the Fe-zeolite samples.

Element (wt%)	**Fe(II)$_{TT}$ZSM-5**	**Fe(III)$_{TT}$ZSM-5**
O	54.3	52.8
Al	2.8	2.7
Si	42.6	43.7
Na	0	0.1
Fe	0.2	0.8

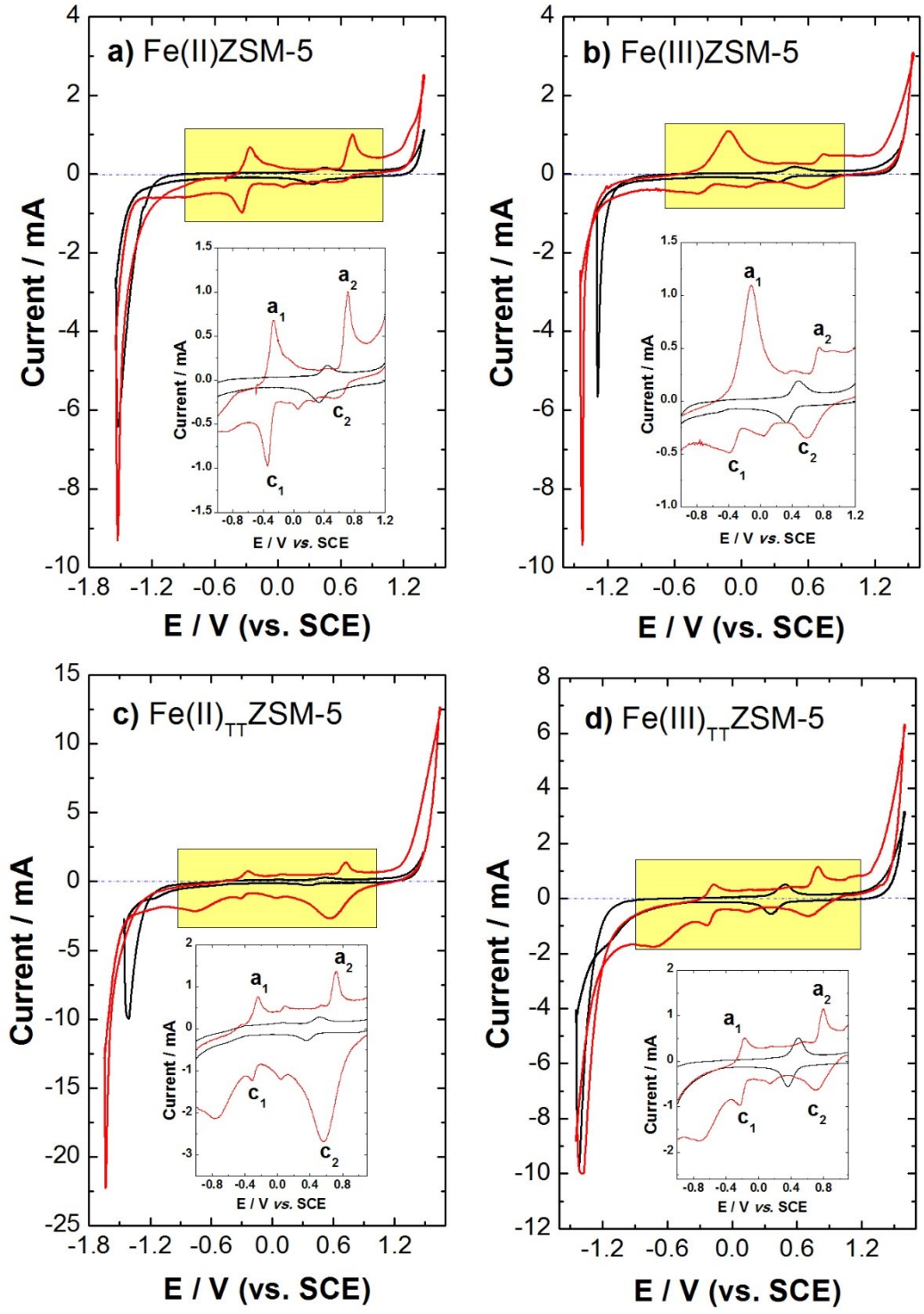

Figure S6. Cyclic voltammograms of a) Fe(II)ZSM-5, b) Fe(III)ZSM5, c) $Fe(II)_{TT}ZSM5$ and d) $Fe(III)_{TT}ZSM5$ modified electrodes recorded at 50 mV s^{-1} in the absence of dye (black curve) and in the presence of 0.274 mmol L^{-1} of ARS (red curve) in NaCl (0.10 mol L^{-1}) / H_2SO_4 (1.0 mmol L^{-1}).

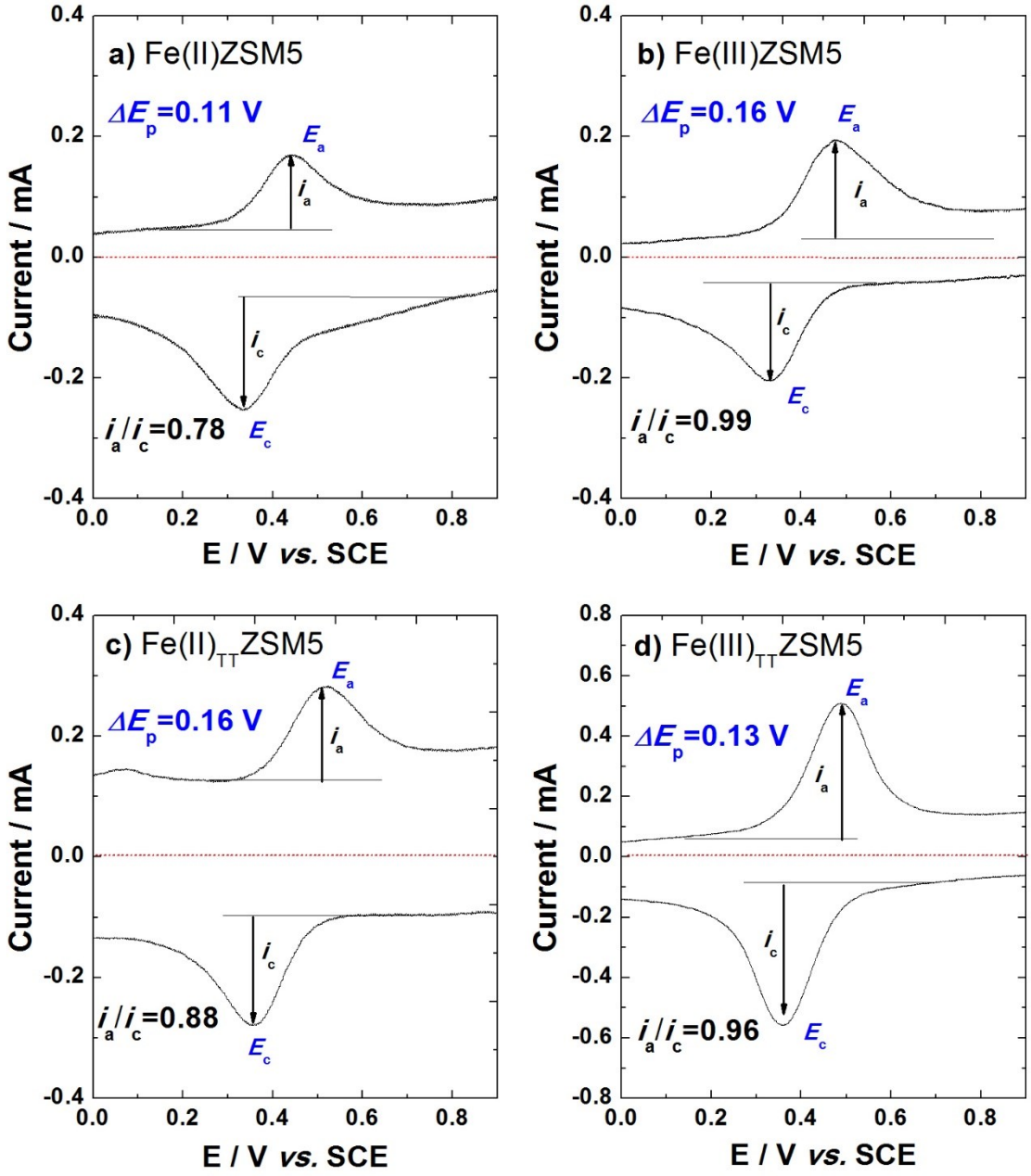

Figure S7. Cyclic voltammetry characterization of a) Fe(II)ZSM-5, b) Fe(III)ZSM5, c) $Fe(II)_{TT}ZSM5$ and d) $Fe(III)_{TT}ZSM5$ modified electrodes recorded at 50 mV s^{-1} in N_2 de-aerated 0.1 mol L^{-1} NaCl containing 1.0 mmol L^{-1} H_2SO_4 in the absence of dye.

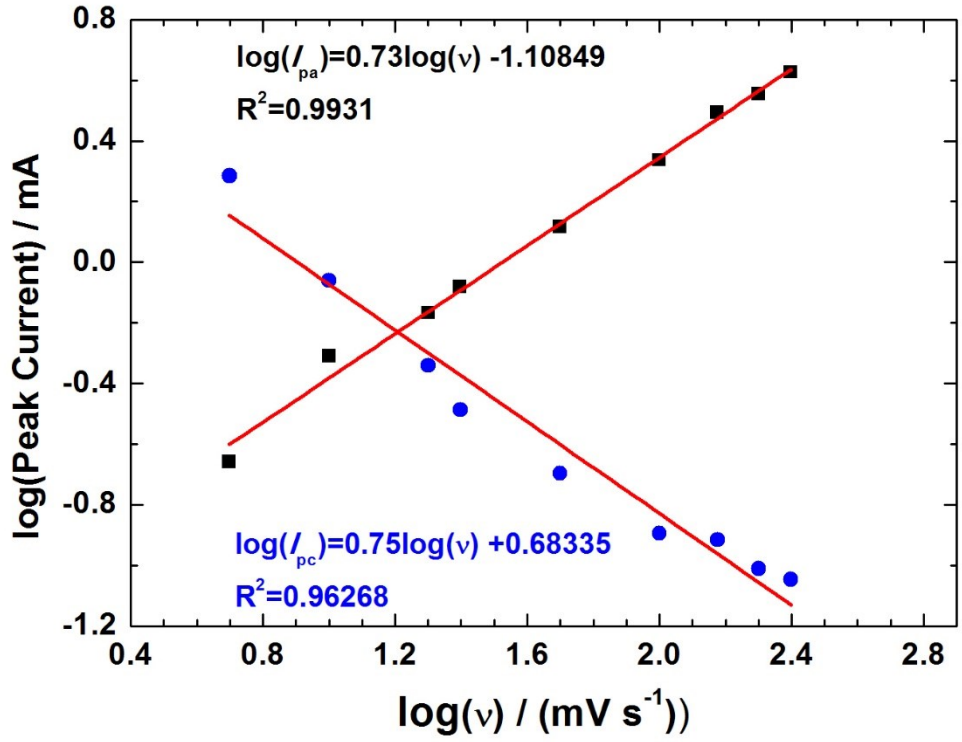

Figure S8. The dependences of logarithm of peak currents on logarithm scan rate.

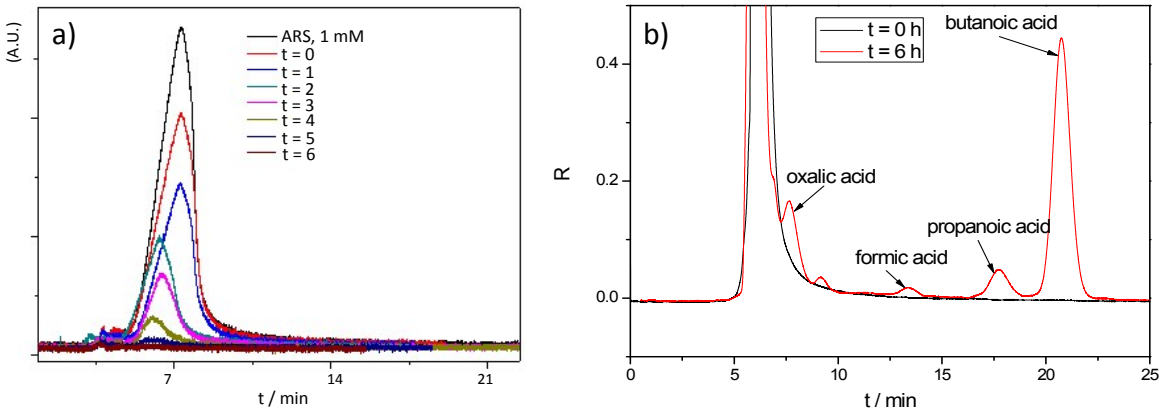

Figure S9. a) HPLC chromatograms of ARS (1 mM) and at different reaction times for the dye oxidation (λ = 550 nm, RP18) and b) HPLC-UV chromatograms corresponding to the beginning (—) and to the end of the electrolysis (—).