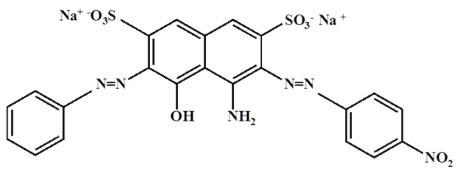**Table S1:** Summary of different type of wastewater treatment by hydrogen peroxide assisted electrocoagulation processes

Type of wastewater	Anode-Cathode	Current density or current	Time	pH	[H_2O_2]	Treatment efficiency
Olive mill [22]	Fe-Fe Al-Al	20-75 mA cm^{-2}	1-3 h	6.5 5.5	2.3%	COD = 62-86 % Fe electrodes is better
Nonylphenol polyethoxylate and Textile wastewater [20]	Fe-Fe Al-Al	1.5 A	5 min 15 min	8	40 mgL^{-1}	Degradation = 95 %
Chemical-Mechanical Planarization wastewater [33]	Fe-Fe	1A	10 min	9	120 mgL^{-1}	Turbidity = 100%
Food wastewater [21]	Al-Al	18.2 mA cm^{-2}	60 min	4	9.79 mM	COD removal = 96% BOD removal = 95%
Synthetic dye wastewater [18]	Fe-Stainless steel	25 mA cm^{-2}	8 min	6	3	Color removal = 98%
Synthetic wastewater (SDS) [17]	Fe-Fe	0.5 mA cm^{-2}	10 min	5	50 mg L^{-1}	SDS removal = 81.6%
Metal plating effluent [19]	Fe-Fe	22 mA cm^{-2}		2.6	20 mM	TOC removal =70%
Pharmaceutical wastewater [35]	Fe-Fe	1.7–1.9 mAcm^{-2}	30 min	3	300 mgL^{-1}	COD removal =57.7%
Liquid organic fertilizer wastewater [34]	Fe-Fe	50 mA cm^{-2}	45 min	3	25 mM	TOC removal = 87% COD removal =91%

Table S2: Characteristics of the dye molecules used in this study

Details of dye molecule		Molecular structure

Molecular Formula   : $C_{22} H_{14} N_6 Na_2 O_9 S_2$

Molecular Weight (g/mol)   : 615.5

Type   : Diazo dye

λ_{max} (nm)   : 617-620

Solubility in water(20℃) g/L   : 30

3.2 *Influence of sodium chloride (NaCl) concentration*
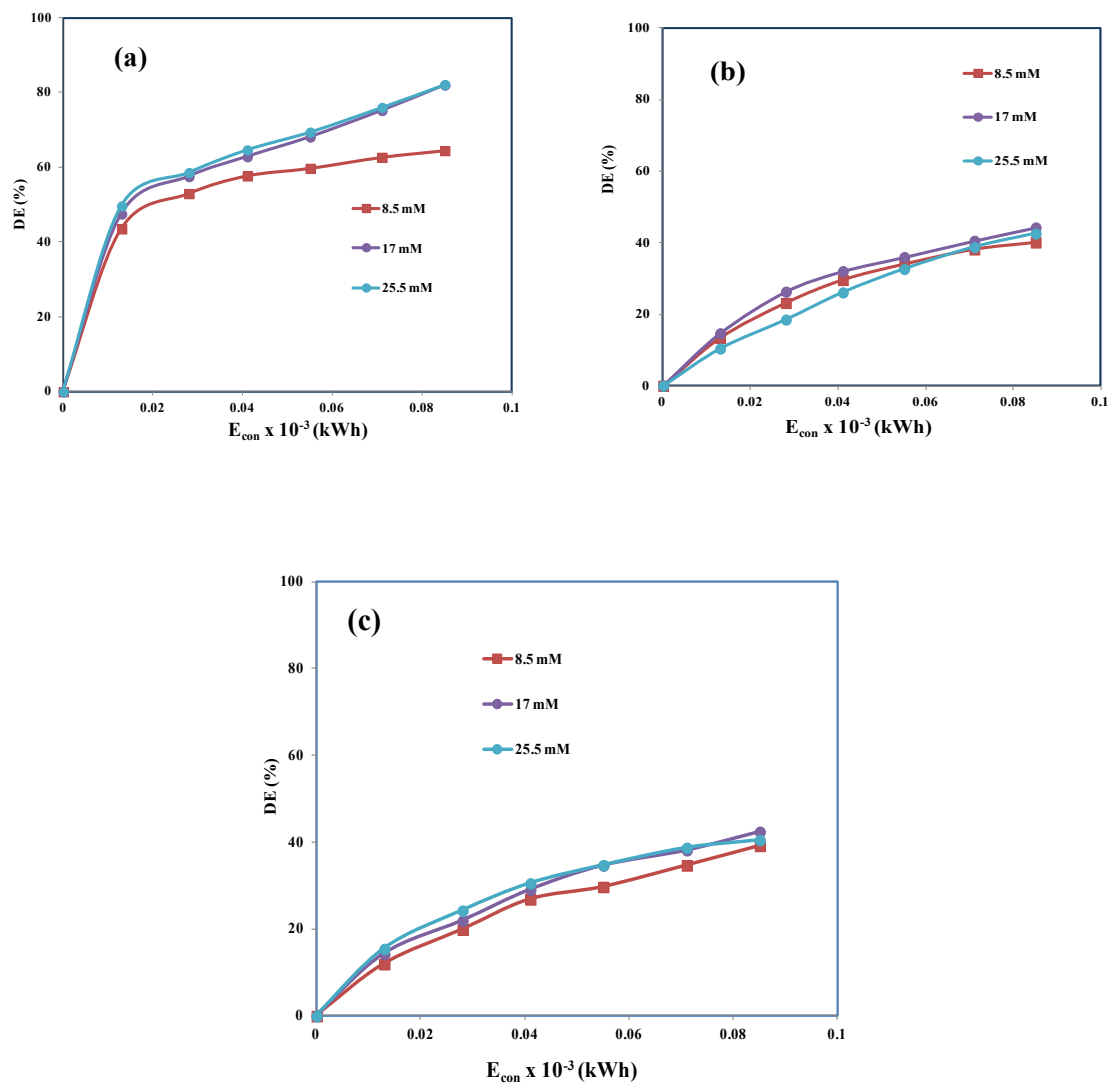

Fig. S3 - Degradation efficiency as a function of E_{con} at by EC in the presence of (a) PMS, (b) HP and (c) PDS at different NaCl concentration. (C_{AB} = 0.16 mM, $C_{oxidant}$ = 0.07 mM, pH = 7 ± 0.2 and Current = 50 mA).

S4: Electrical energy consumption

The calculated E_{con} values along with obtained degradation efficiency are plotted against electrolysis time in Figure S3. Oxidant assisted EC processes are exhibits good degradation efficiency with less energy consumption. The more than 99% degradation efficiencies are achieved from EC assisted with PMS, HP and PDS at energy consumption of are 1.7, 4.1 and 3.3 Wh (g dye)$^{-1}$ respectively.
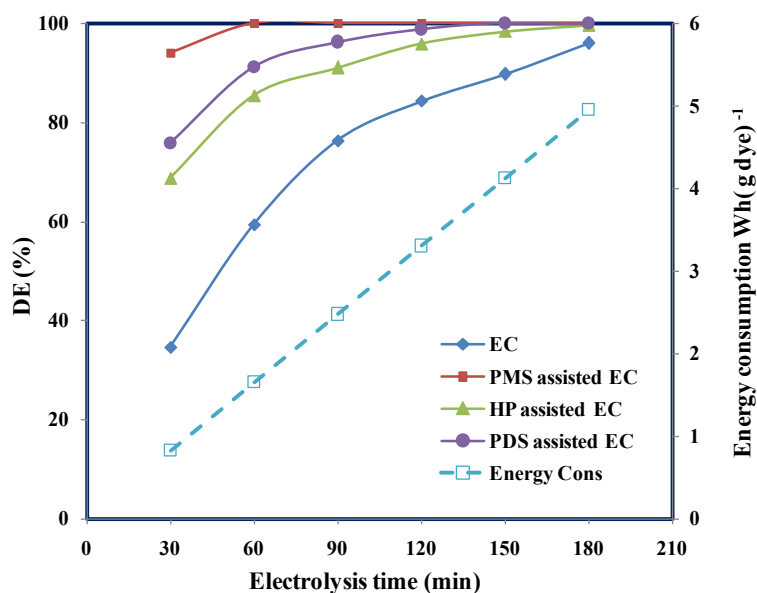

Fig. S4. Degradation efficiencies as a function of energy consumption by EC and oxidant assisted EC. ((C$_{AB}$ = 0.16 mM, C$_{NaCl}$ = 17 mM, C$_{PMS}$ = C$_{PDS}$ = 0.17 mM, C$_{HP}$ = 0.13 mM, current = 50 mA and initial pH = 5).