Electronic Supporting Information

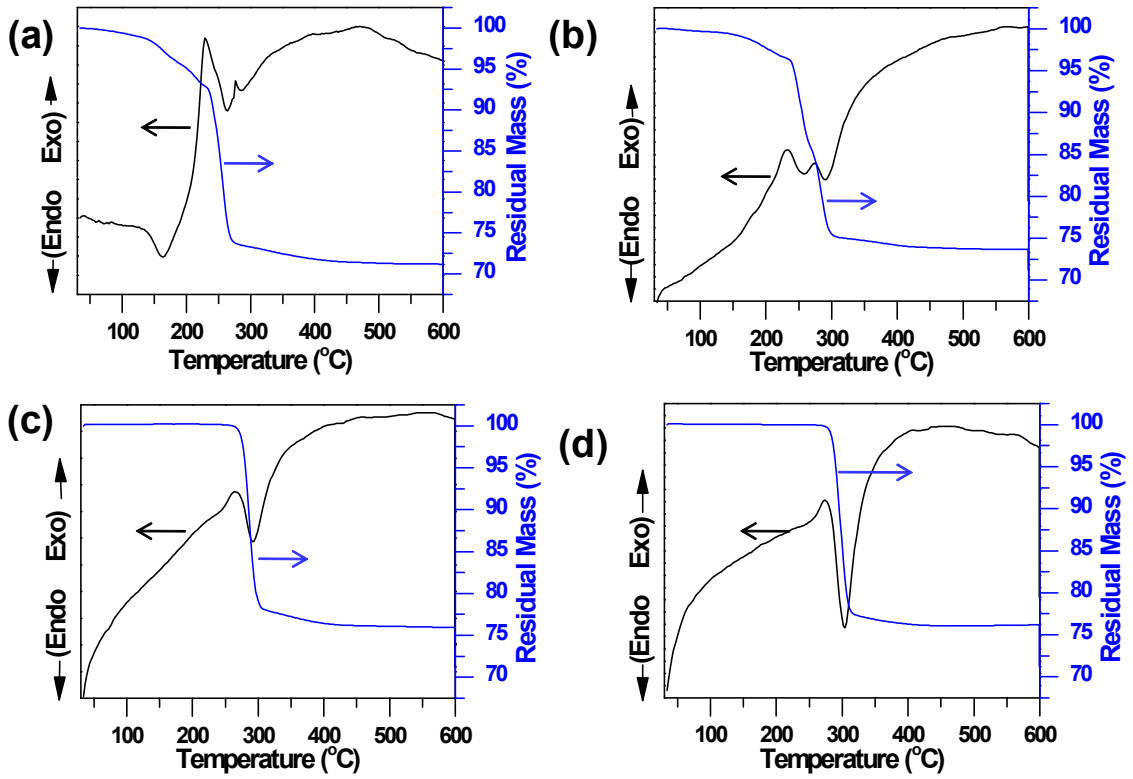

Figure S1: DTA and TG of the as-prepared samples prepared at 150°C for (a) 2h, (b) 5h, (c) 12h and (d) 24h.

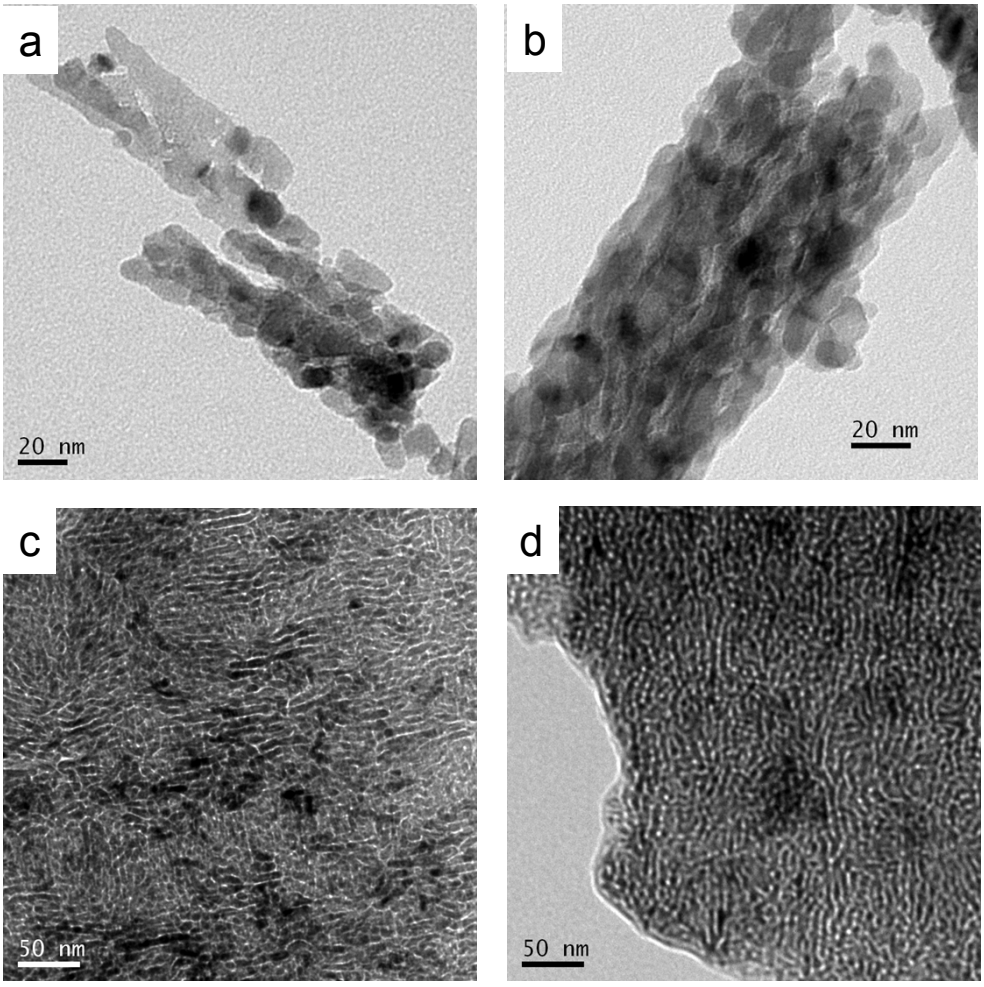

Figure S2: Higher magnification images of TEM.

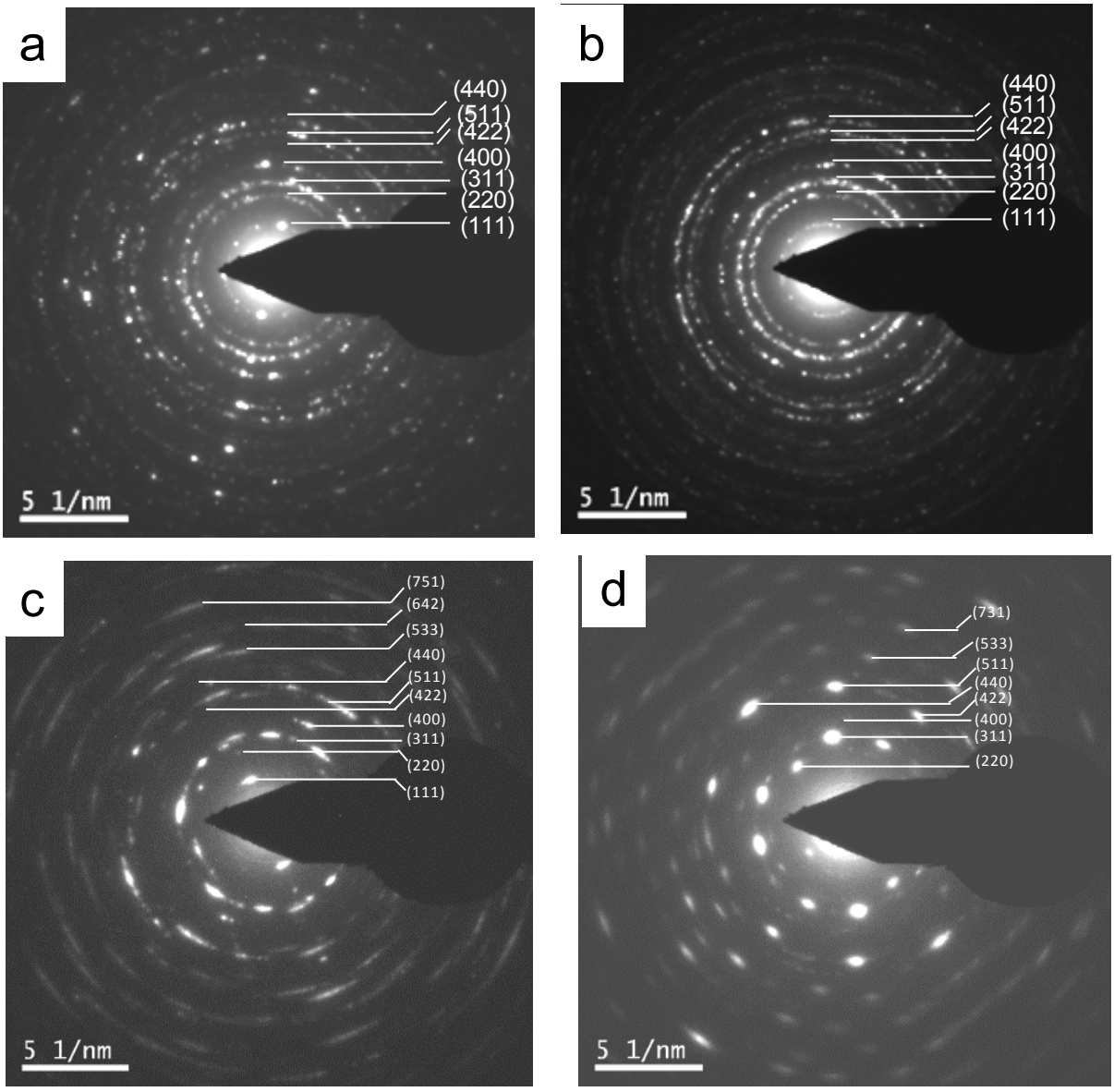

Figure S3: Selected area electron diffraction pattern (SAED) of Co_3O_4 prepared hydrothermally at times (a) 2h (b) 5h (c) 12 h and (d) 24 h.

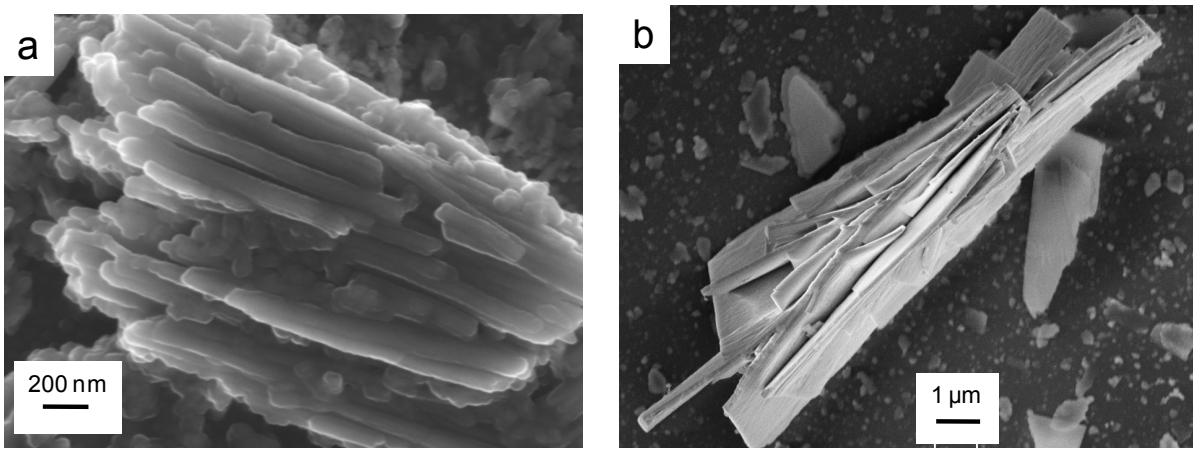

Fig. S4: FESEM images of (a) as-prepared sample synthesized at 150^{o}C/8h, and (b) the corresponding calcined (300^{o}C) sample

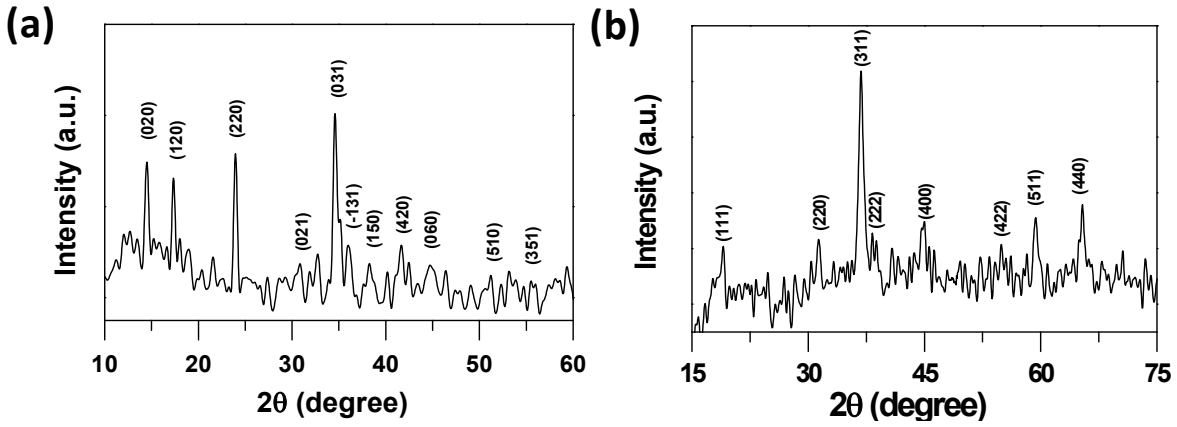

Fig. S5: XRD pattern of (a) as prepared sample synthesized at 150^{o}C/8h, and (b) the corresponding calcined (300^{o}C) sample

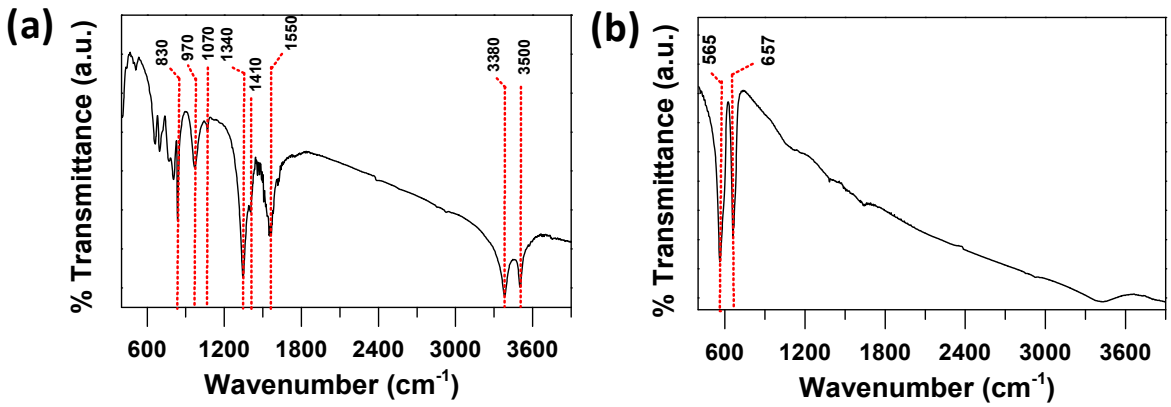

Fig. S6: FTIR of as-prepared sample synthesized at 150^{o}C/8h, and (b) the corresponding calcined (300^{o}C) sample

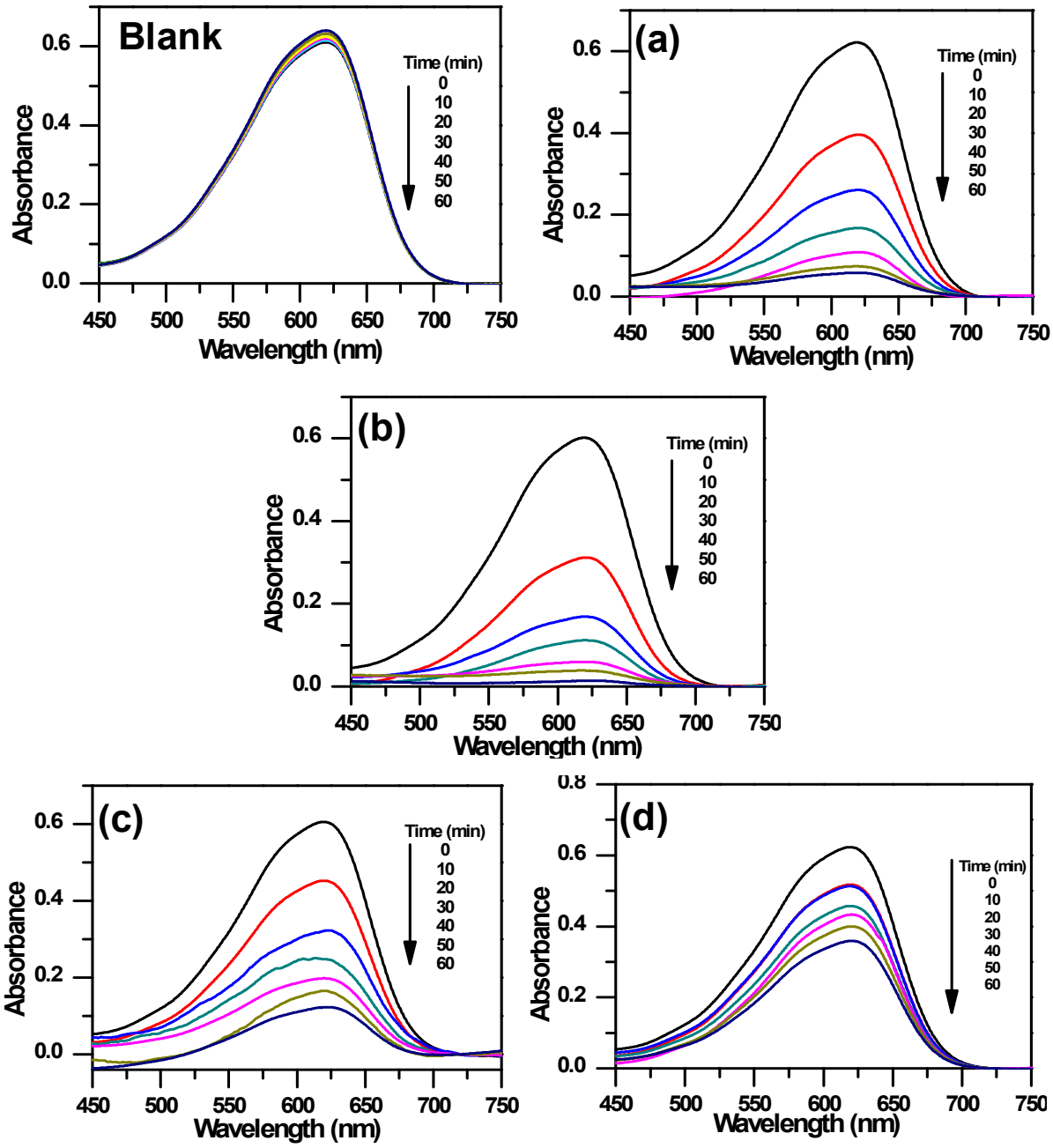

Figure S7: Successive UV-vis absorption spectra with time for the degradation of Chicago sky blue 6B dye at 25 °C using hydrogen peroxide in absence (blank) or in presence of catalyst by Co_3O_4 hydrothermally at 150°C for times (a) 2h (b) 5h (c) 12 h and (d) 24 h.

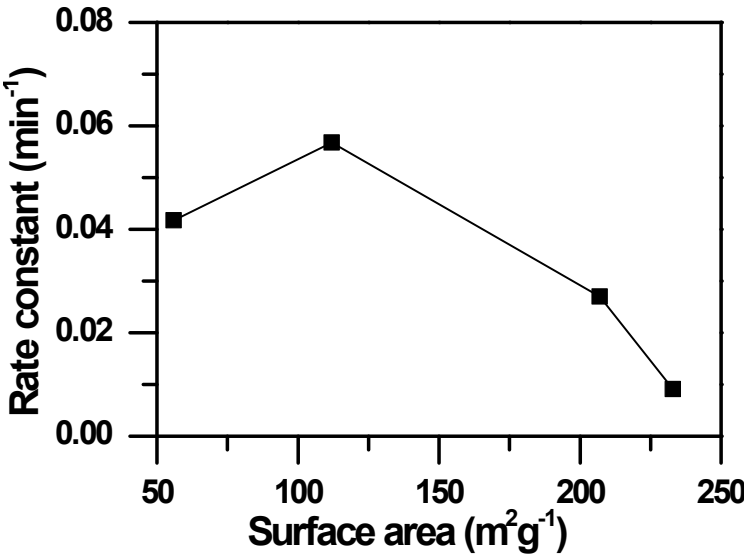

Figure S8: Rate constant vs. surface area plot for the degradation of Chicago sky blue 6B dye using hydrogen peroxide in presence of catalyst Co_3O_4

Table S1: The textural properties of Co_3O_4 particles calcined at 300°C

Synthesis Time (h) at 150°C	S_{BET} (m^2g^{-1})[a]	$S_{External}$ (m^2g^{-1})[b]	$S_{Micropore}$ (m^2g^{-1})[c]	$V_{p\text{-}Total}$ (cm^3g^{-1})[d]	$V_{p\text{-}Micropore}$ (cm^3g^{-1})[e]	Pore diameter (nm)[f]
2	56	56	0	0.46	0	10.1
5	112	112	0	0.50	0	7.4
12	207	165	42	0.30	0.02	3.5
24	233	141	92	0.24	0.04	3.3

[a]BET surface area; [b]External surface area; [c]Micropore surface area; [d]Total pore volume; [e]Micropore volume; [f]Pore diameter by BJH desorption.

Scheme S1: Mechanism for the degradation of Chicago Sky Blue 6B via decomposition of H_2O_2 in the presence of Co_3O_4 catalyst.

(i) $H_2O_2 + \text{Catalyst-}Co^{3+} \rightarrow \text{Catalyst-}Co^{2+} + H^+ + HO_2^{\bullet}$

(ii) $H_2O_2 + \text{Catalyst-}Co^{2+} \rightarrow \text{Catalyst-}Co^{3+} + {}^{\bullet}OH + HO^-$

(iii) ${}^{\bullet}OH + \text{Catalyst-}Co^{2+} \rightarrow \text{Catalyst-}Co^{3+} + HO^-$

(iv) $\text{Catalyst-}Co^{3+} + HO_2^{\bullet} \rightarrow \text{Catalyst-}Co^{2+} + H^+ + O_2$

(v) $\text{Catalyst-}Co^{2+} + HO_2^{\bullet} \rightarrow \text{Catalyst-}Co^{3+} + HO_2^-$

(vi) $H_2O_2 + {}^{\bullet}OH \rightarrow H_2O + HO_2^{\bullet}$

(vii) $H_2O_2 + HO_2^{\bullet} \rightarrow H_2O + O_2 + {}^{\bullet}OH$

(viii) ${}^{\bullet}OH$ + CSB (Dye) $\rightarrow$ Degradation of CSB (colourless)