Figure S1 **(a)** TEM and **(b)** SEM images and **(c)** XRD pattern of Fe_3O_4 NPs
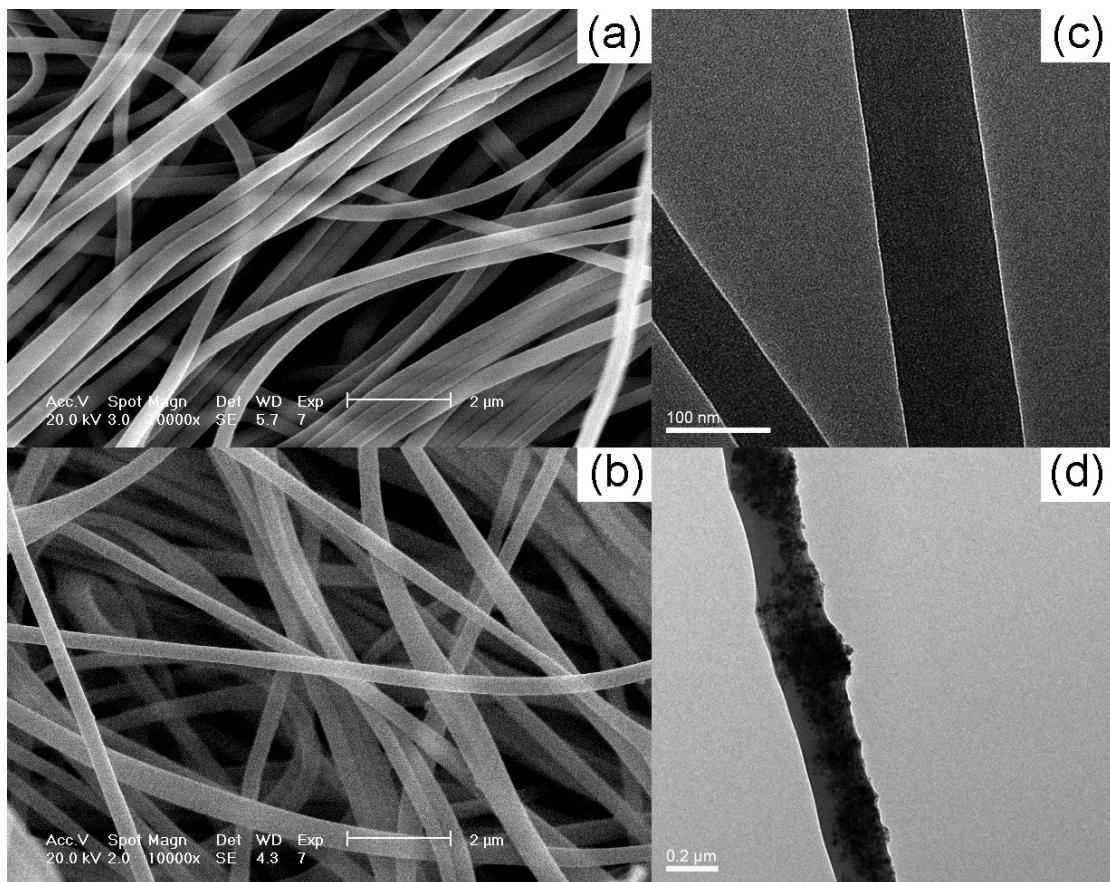
Figure S2 SEM images of (**a**) NFM and (**b**) Fe$_3$O$_4$ NPs/NFM; and TEM images of (**c**)

NFM, and (**d**) Fe$_3$O$_4$ NPs/NFM
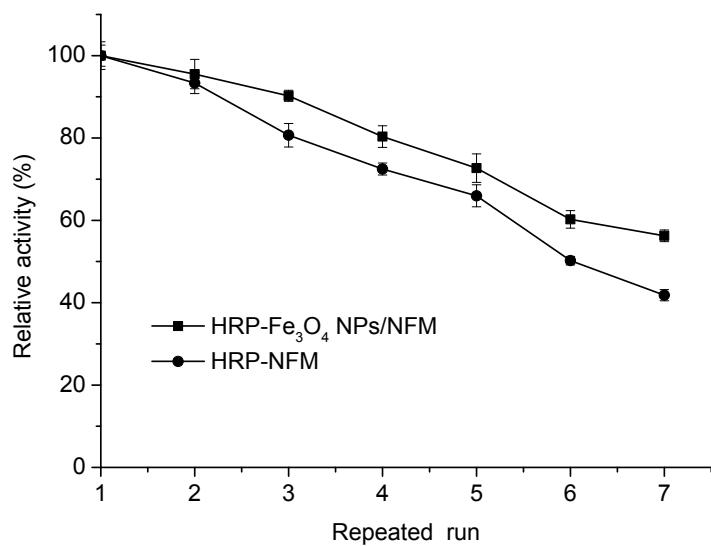
Figure S3 Reusability of HRP-NFM and HRP-Fe$_3$O$_4$ NPs/NFM

Table S1 Experimental design levels of chosen variables

Variables	Levels in Box–Behnken design		
Coded level	Low (−1)	Middle (0)	High (+1)
pH	3	6	9
Temperature (°C)	20	35	50
H_2O_2 initial concentration (mM)	0.01	0.05	0.1

Table S2 Experimental and predicted values

Std. run order	pH	T	C_{H2O2}	Y[1]					
				Free HRP		HRP-NFM		HRP-Fe$_3$O$_4$ NPs/NFM	
				Y_{exp}	Y_{pre}	Y_{exp}	Y_{pre}	Y_{exp}	Y_{pre}
1	3	20	0.05	13.08	12.89	5.74	5.70	11.92	11.88
2	9	20	0.05	4.38	4.45	6.04	6.00	13.4	13.52
3	3	50	0.05	11.64	11.58	8.56	8.60	12.17	12.04
4	9	50	0.05	3.39	3.58	6.48	6.52	13.82	13.86
5	3	35	0.01	13.53	13.92	7.04	7.01	12.95	12.91
6	9	35	0.01	3.95	4.09	4.0	3.98	13.81	13.60
7	3	35	0.1	11.45	11.31	4.04	4.06	11.30	11.50
8	9	35	0.1	5.10	4.70	5.27	5.30	14.23	14.26
9	6	20	0.01	11.62	11.41	6.32	6.39	14.75	14.83
10	6	50	0.01	10.07	9.74	8.48	8.47	14.76	14.92

[1] Yexp and Ypre are experimental and predicted responses.

11	6	20	0.1	9.50	9.83	5.92	5.94	14.45	14.29
12	6	50	0.1	9.11	9.32	7.34	7.28	14.79	14.71
13	6	35	0.05	13.92	13.81	11.85	11.79	13.53	13.38
14	6	35	0.05	13.73	13.81	11.97	11.79	13.41	13.38
15	6	35	0.05	13.95	13.81	11.09	11.79	13.5	13.38
16	6	35	0.05	13.93	13.81	12.00	11.79	13.54	13.38
17	6	35	0.05	13.53	13.81	11.90	11.79	12.9	13.38