

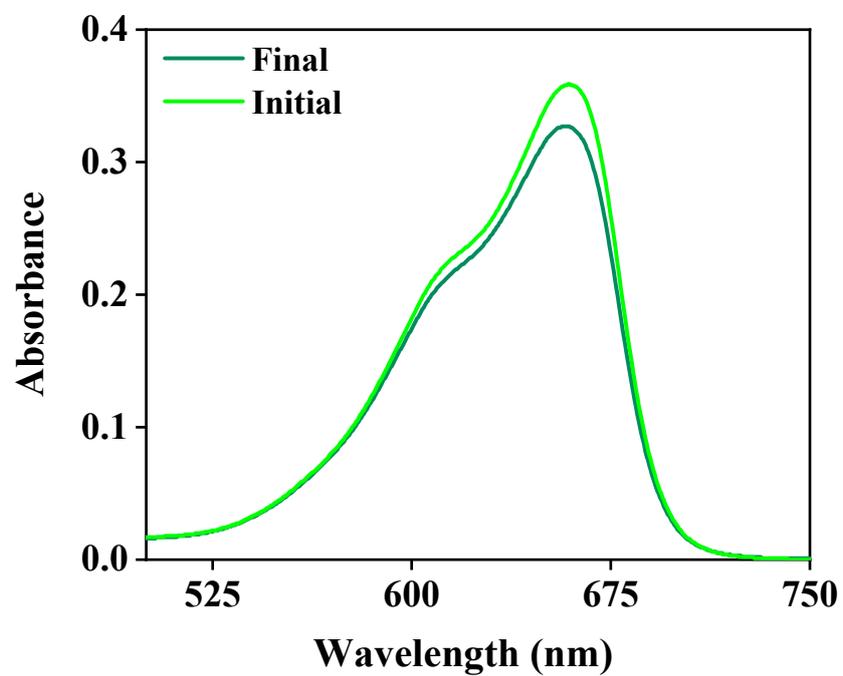
**Fig. S1.** Schematics for the synthesis of  $Mn_3O_4/AHC$  material and its application in adsorptive removal of dyes.

**Table S1.** Isotherm model parameters for the adsorption of MB dye onto AHC and  $Mn_3O_4/AHC$ .

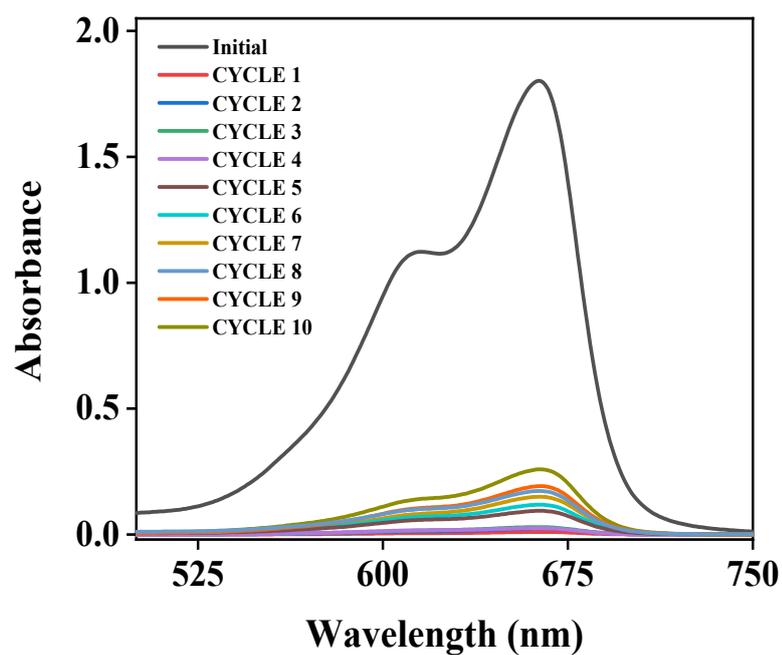
Adsorbent	Langmuir Isotherm			Freundlich Isotherm		
	$q_m$ (mg/g)	$K_l$ (L/mg)	$R^2$	$1/n$	$K_f$ (L/mg)	$R^2$
AHC	26.23	36.33	0.97	8.58	12.74	0.7
$Mn_3O_4/AHC$	113.37	3357.37	0.99	6.423	53.74	0.97

**Table S2.** Kinetic parameters for the adsorption of MB dye onto AHC and Mn<sub>3</sub>O<sub>4</sub>/AHC.

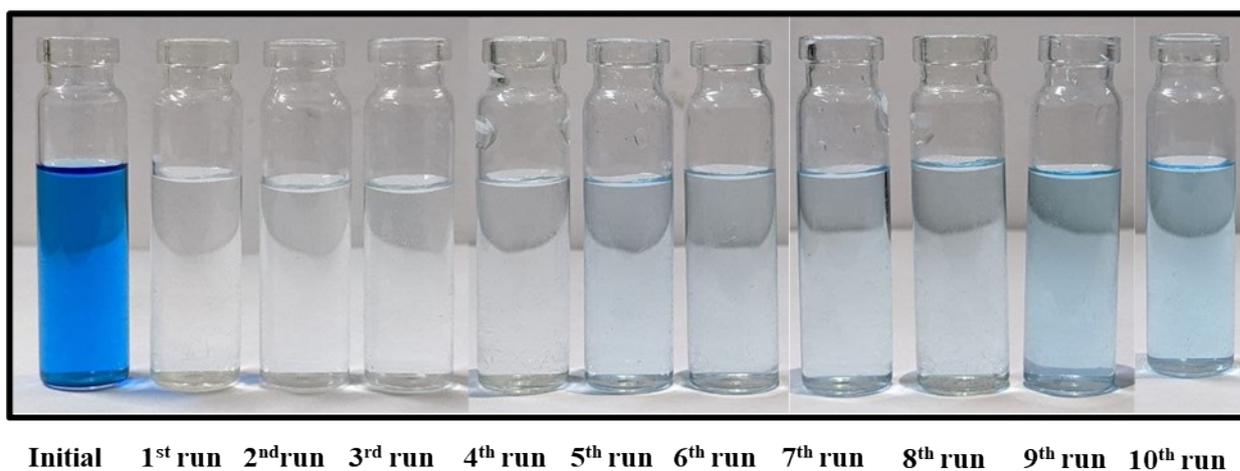
Adsorbent	Pseudo-first order			Pseudo-second order		
	q <sub>e</sub> (mg/g)	k <sub>1</sub> (min <sup>-1</sup> )	R <sup>2</sup>	q <sub>e</sub> (mg/g)	k <sub>2</sub> (min <sup>-1</sup> )	R <sup>2</sup>
AHC	1790.23	-0.00081	0.54162	8.37	12.4 x 10 <sup>-3</sup>	0.99
Mn <sub>3</sub> O <sub>4</sub> /AHC	3.27	-0.00011	0.87566	7.25	8.823 x 10 <sup>-3</sup>	0.98



**Fig S2.** Methylene blue removal studies using bare Whatmann filter paper.



**Fig S3.** UV spectrum of recyclability study of  $Mn_3O_4/AHC$  based membrane for MB removal.



**Fig S4.** Digital photograph of permeates obtained during the recyclability study.