Supporting information for

Integrated chitosan-based polyelectrolyte membrane and microwave-assisted advanced oxidation processes for sustainable coir retting wastewater treatment

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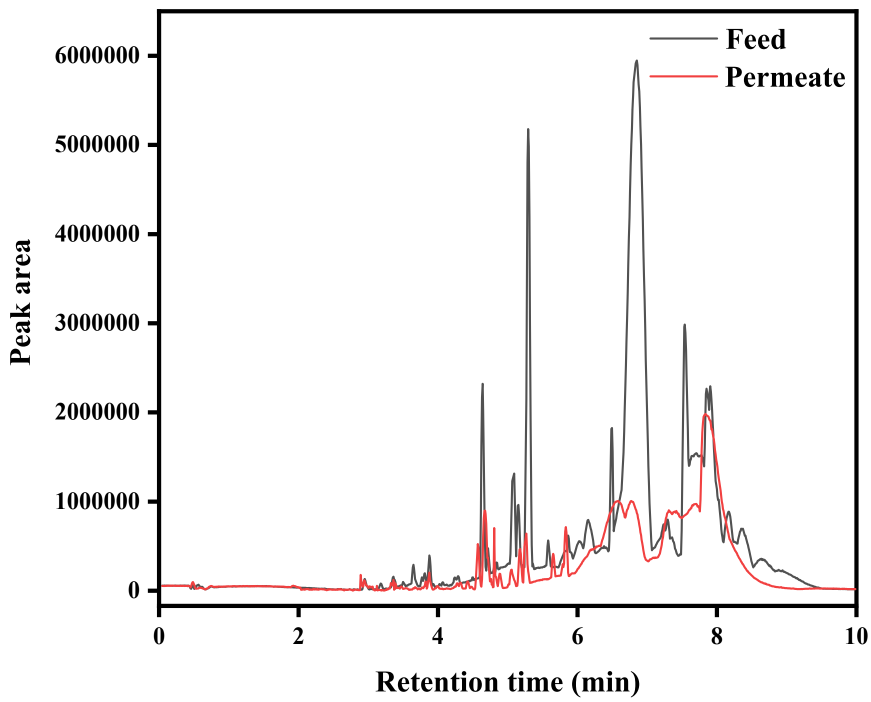

Fig S1. TICs of feed water and permeate obtained from LC-Q-ToF-MS analysis

Table S1. Water quality parameters of coir ret effluent before and after low-pressure filtration through CHI/PAA

pH (Feed)	Bilayer	pH (Permeate)	CONDUCTIVITY ($\mu S\ cm^{-1}$)	TDS (ppm)	SALINITY (ppm)
Feed		8.12	2583	1858	950
Water quality parameters of coir ret effluent with different pH after low-pressure filtration through CHI/PAA					
3	3.5	3.8	2040	1480	127
	5.5.	3.4	1831	1410	117
	7.5	3.6	1933	1350	117
	9.5	3.28	2400	1200	1310
4	3.5	4.8	1333	931	776
	5.5	4.6	600	300	1410
	7.5	4.8	1680	1090	887
	9.5	4.3	1500	980	1059
5	3.5	5.4	1336	952	780
	5.5.	5.7	1245	813	865
	7.5	5.3	1199	785	1070
	9.5	5.4	1270	830	983
6	3.5	5.79	1320	964	786
	5.5.	6.3	1140	760	804
	7.5	6.2	1230	810	850
	9.5	6.1	1090	728	970
Native pH (8.12)	bare	6.55	1011	719	453
	3.5	6.8	967	686	435
	5.5	6.58	960	683	430
	7.5	7.33	968	688	433
	9.5	6.58	998	709	447

Table S2. Comparison of CHI/PAA membrane performance with previously reported membranes for water treatment.

Membrane / Modification	Feed Type	Optimum pH	Removal Efficiency (%)	Reference
CHI/PAA	Coir retting effluent	3	95.4	Present study
PEI/PSS	Organic micropollutant(oxybenzone)	10	98	1
PAA/CHI	Textile dye(Methylene Blue)	10.5	79.9	2
	Coomassie Brilliant Blue	7	75.7	
PAA/PEI	Textile dye (Methylene Blue)	10.5	87.1	2
	Coomassie Brilliant Blue	10.5	87.7	
CHI/PAA	Gray water	4	56	3
CHI/PAA	Textile wastewater	4	81	4
CHI/PAA	Organic dyes (RB5)	8	96	5
PAN/PAA	Methylene blue (MB)	-	96.8	6

Table S3. The efficiency of MW-F for coir ret effluent treatment under varying H_2O_2, Fe^{2+} and pH

$[H_2O_2]$, mM	$[Fe^{2+}]$, mM	pH	Conductivity (µS cm^{-1})	TDS (ppm)	Salinity (ppm)	COD reduction (%)
Feed			2583	1858	950	
Effect of H_2O_2						
10	0.18	8.1	1467	834	667	23.07
100	0.18	8.1	1097	808	507	30.76

200	0.18	8.1	945	655	406	38.46
500	0.18	8.1	530	553	339	26.92
Effect of Fe^{2+}						
200	0.18	8.1	1100	800	460	36.5
200	1.79	8.1	1140	834	512	33.4
200	3.58	8.1	1180	840	522	32.7
200	8.95	8.1	1200	860	546	27.8
Effect of pH						
200	0.18	3	980	712	468	66.3
200	0.18	8.1	1100	800	460	36.5
200	0.18	12	1260	880	530	41.3

Fig S2 . Visual comparison of coir retting effluent before and after microwave-assisted Fenton treatment at different Fe^{2+} concentrations (0.18 mM -8.96 mM) under various pH conditions. (a) Effluent color changes at pH 3 **(**b), at pH 8.12**,** and (C) pH 12

Table S4. Combination of Microwave-assisted AOP and CHI/PAA membrane for the treatment of coir ret effluent; $[Fe^{2+}]$ = 0.18 mM, pH = 8.12

H_2O_2 Conc.	Bilayer	pH	Conductivity (µS cm^{-1})	TDS (ppm)	Salinity (ppm)	COD reduction %	% of Rejection	Flux (m^3/ (m^{2}day)
Bare	Bare	6.1	1481	1054	675	42.30	54.2	319.9
0.2M	3.5	6.2	763	542	338	53.84	83.5	303.4
	5.5	6.5	1061	751	475	76.92	97.5	212.1
	7.5	6.0	1038	737	465	65.38	72.1	117.4
	9.5	5.8	1000	710	447	53.84	67.2	75.4

Table S5. Performance comparison of the MW-Fenton process coupled with CHI/PAA membrane filtration and previously reported membranes for water treatment

Low-pressure Membrane / Modification	**Feed Type**	**Pretreatment / AOPs**	**pH**	**Removal Efficiency (%)**	**Reference**
CHI/PAA	*Coir retting effluent*	*MW-Fenton*	*8.12*	*97.5*	*Present study*
NF/RO	Pharmaceuticals (diclofenac, acetamidoantipyrine, hydrochlorothiazide, sulfamethoxazole)	Photocatalysis (P25 TiO_2); photo-Fenton (Fe_2O_3/SBA-15)	*7*	99	[7]
UF	Sulfamethoxazole and 17α-ethinylestradiol	Heterogeneous Fenton process (FeOCl-loaded ZrO_2/TiO_2 ceramic membrane)	6.2	92	[8]
Polyvinylidene difluoride (PVDF) membrane	Real textile dyeing wastewater	Photocatalytic process	8.1	94	[9]
MF - modified ceramic membrane	Wastewater from a major WWTP	Catalytic ozonation with TiO_2-Al_2O_3	6.8	88	[10]
PAA@NM88B/GO membrane	Textile wastewater	Photo- Fenton	4-7	98	[11]
NF	Pharmaceuticals in natural waters and secondary effluent	Ozonation	7.6	97 % in natural waters	[12]

				90 % in secondary effluent	
MF + NF	Landfill leachate	Fenton pretreatment	3.8	color:76%; Humic substances: 50%	[13]
Ceramic membrane	Refinery wastewater	Fenton-activated carbon (AC) adsorption	4.1	70	[14]
Mixed matrix Fe_3O_4/polyvinylidene fluoride membranes	Industrial wastewater	Fenton oxidation	4	42.2	[15]
NF270 membrane	Sesame wastewater	Electro-Fenton (EF) process	8–10	97.68	[16]
MF and RO	Textile wastewater	Fenton	3	98	[17]

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