Electronic Supplementary Information

Synthesis of composite imprinted polymer membranes for the selective removal of 17ß-estradiol from water

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Composition of the different MIP/NIP particles prepared via precipitation polymerization.

Table 1s. Composition of the MIP and NIP particles synthesized.

particle	template	functional monomer	porogen	cross-linker
MIP-1	E2	MAA	acetonitrile/toluene	DVB
NIP-1	-	MAA	acetonitrile/toluene	DVB
MIP-2	E2	MAA	acetonitrile/toluene	TRIM
NIP-2	-	MAA	acetonitrile/toluene	TRIM
MIP-3	E2	MAA	acetonitrile/toluene	EGDMA
NIP-3	-	MAA	acetonitrile/toluene	EGDMA

SEM images of all the different MIP/NIP particles prepared via precipitation polymerization.

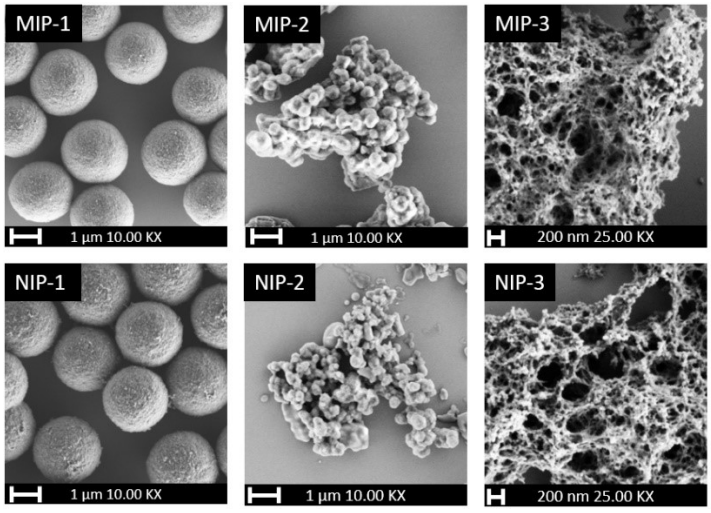

Figure 1s. SEM images of different particles synthesized with different cross-linkers.

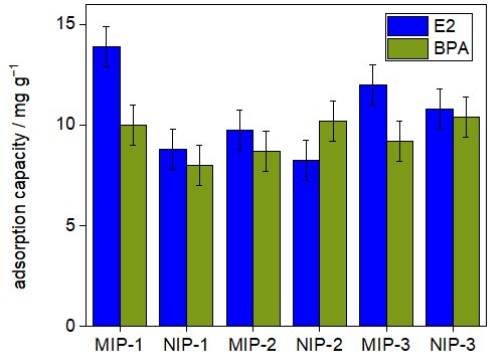

Figure 2s. Adsorption capacities of different MIP and NIP particles towards E2 and BPA.

The same trend as MIP-1 and NIP-1 was not observed for NIP particles in the adsorption capacities. For example, NIP-2 demonstrated a preference for adsorbing BPA over E2.

Table 2s. IF and SF for different MIP and NIP particles.

	IF	SF
MIP-1/NIP-1	1.6	1.4
MIP-2/NIP-2	1.1	1.3
MIP-3/NIP-3	1.2	1.1

Breakthrough curves

Figure 3s a, shows that the E2 concentration of the first permeate sample of the non-irradiated membrane with the MIP particle (MIP-CPES) is 0.1 mg L^{-1}. This *Cp* of 0.1 mg L^{-1} remains almost constant until a feed volume of 120 mL is reached, at which point a sharp increase in the E2 concentration in the permeate is observed. The membrane is saturated at 260 mL, and the E2 concentration in the permeate solution remains stable (~ 4.7 mg L^{-1}) until the end of the filtration experiment at 400 mL. The BT point was identified at 120 mL. Since the reference membrane was already saturated at 20 mL, the adsorption of the E2 in case of MIP-CPES is clearly attributed to the adsorptive effects of the imprinted particles. The BT curve for the irradiated and non-irradiated composite membranes with non-imprinted particles is illustrated in figure 3s b. Notably, the adsorption behaviour of these membranes differs from that of the MIP-CPES membranes. A steady increase in the permeate concentration was observed for both irradiated and non-irradiated membranes with non-imprinted particles, and the initial permeate concentration was found to be 0.2 mg L^{-1} in both cases. As expected, the irradiated membrane with non-imprinted particles (NIP-CPES-EB) filtered a higher volume of feed solution until the BT point was reached compared to the non-irradiated membrane (NIP-CPES), at 120 mL and 60 mL, respectively. The dynamic adsorption loading (Q_{dyn}) was determined at the BT point achieved from the breakthrough curves. Figure 4s presents the dynamic adsorption loadings of the reference and composite membranes. The reference PES membrane exhibited a Q_{dyn} of 1.4 ± 0.5 mg g^{-1}. As anticipated from the breakthrough curves, the MIP-CPE-EB exhibited the highest adsorption loading for E2 with a value of 12.9 ± 1 mg g^{-1}. In contrast, the MIP-CPES demonstrated a lower adsorption loading (11.1 ± 1 mg g^{-1}). Meanwhile, Q_{dyn} was predictably lower for the composite membranes with the non-imprinted particles. NIP-CPES displayed a Q_{dyn} of 3.8 ± 1 mg g^{-1}, a substantially lower value than the corresponding irradiated composite membrane (NIP-CPES-EB, 7.6 ± 1 mg g^{-1}).

Comment [BD]: Please check the numbers of of the figures in this text once more. I made some changes, but wasn't sure if it is correct now.

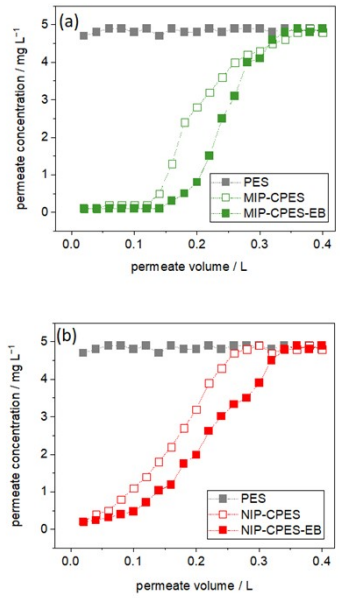

Figure 3s. Breakthrough curves for the reference.

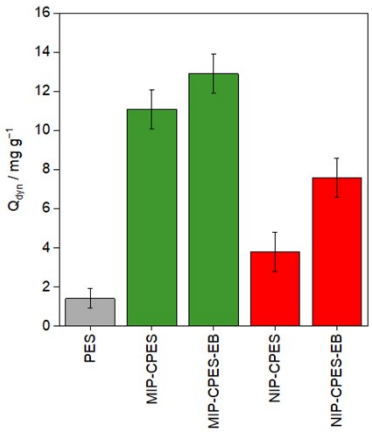

Figure 4s. Dynamic adsorption loading of the composite membranes.

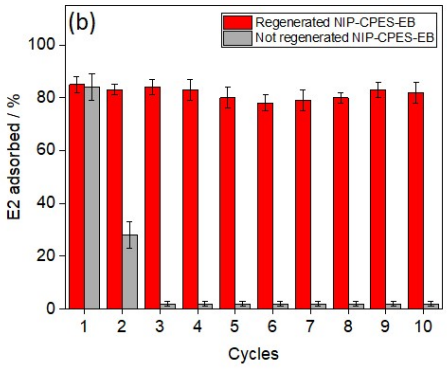

Figure 5s Adsorption capacities of the composite membranes with non-imprinted particles based on 10 cycles of binding/regeneration compared to the non-regenerated composite membranes.