Electronic Supplementary Material (ESI) for Analytical Methods.

SUPPLEMENTARY INFORMATION

Preparation of amphiphilic poly(divinylbenzene-co-N-vinylpyrrolidone)-functionalized polydopamine magnetic nanoadsorbents for enrichment of synthetic cannabinoids in wastewater

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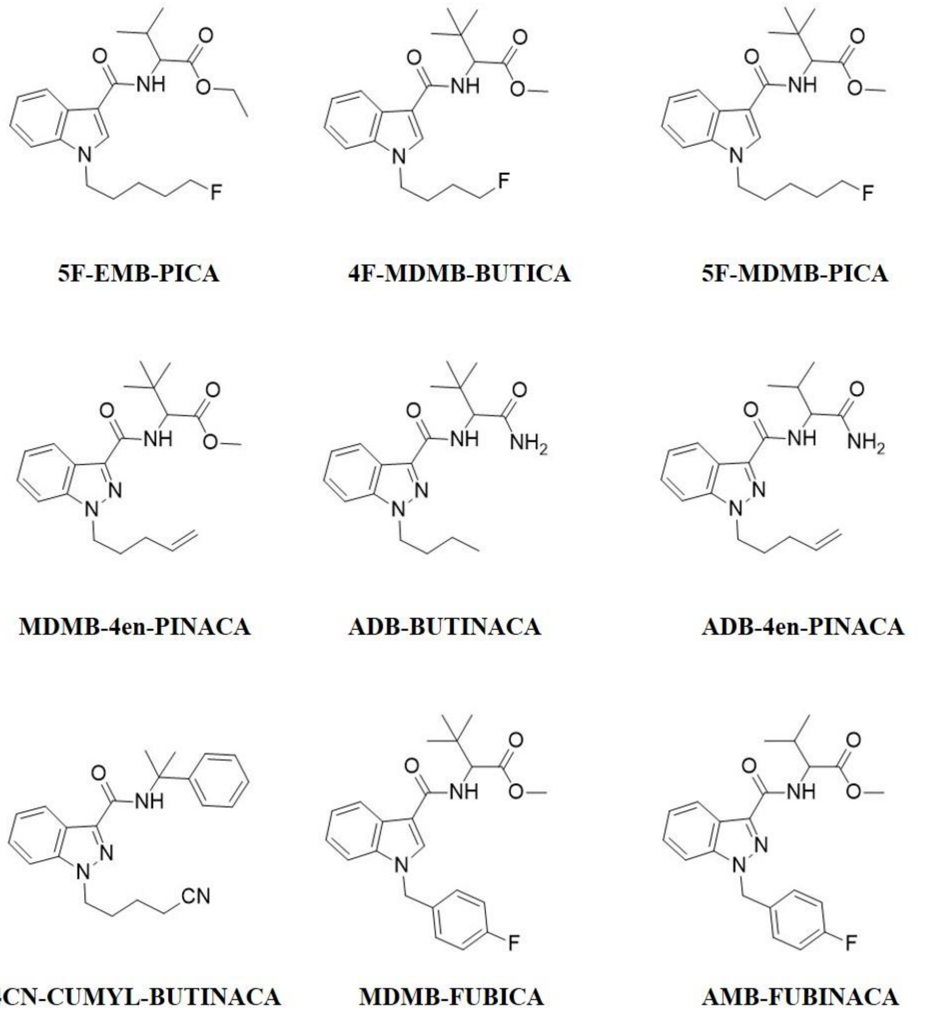

Fig. S1. The structures of nine synthetic cannabinoids.

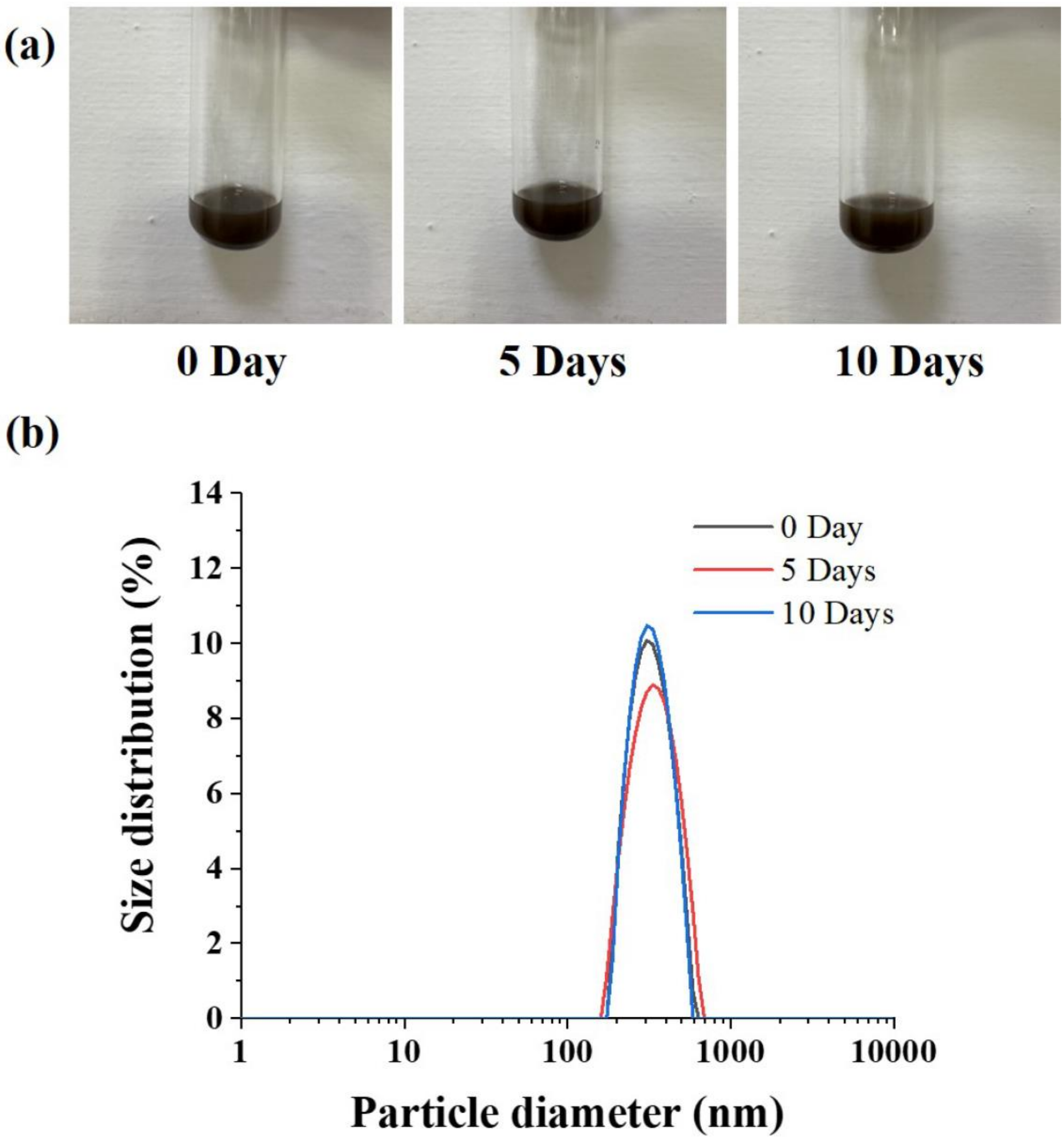

Fig. S2. (a) Digital photographs of Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs dispersion in ethanol for ten days. (b) Dynamic light scattering (DLS) of Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs in ethanol for ten days.

The mean hydrodynamic diameters for Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs dispersed in ethanol were 339 nm on day 0, 354 nm on day 5 and 329 nm on day 10, respectively. As the particle diameter and visual appearance exhibited negligible difference within ten days, the synthesized nanoadsorbents are supposed to be stable during storage.

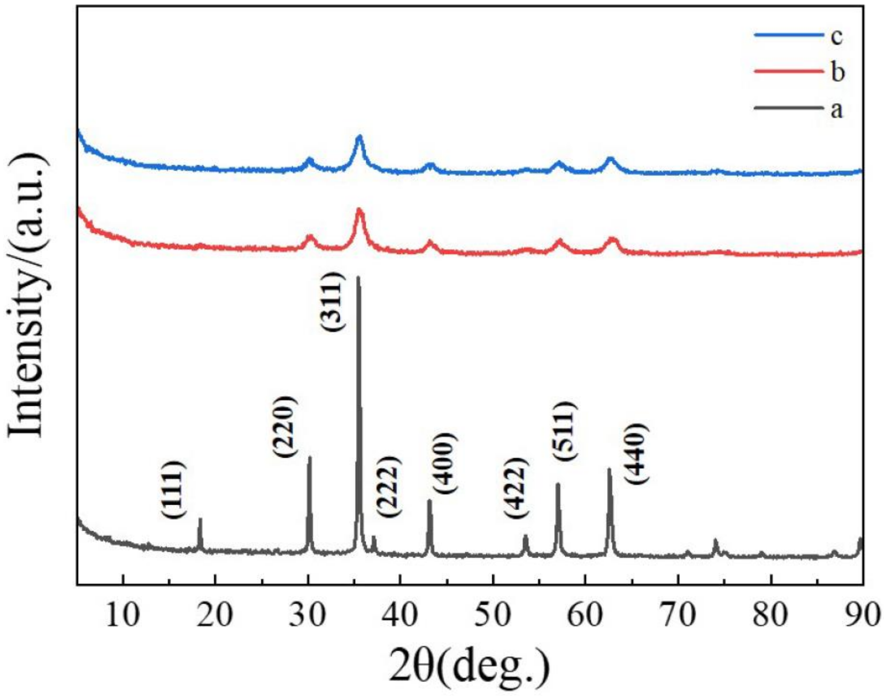

Fig. S3. XRD patterns of (a) Fe_3O_4 MNPs, (b) Fe_3O_4@PDA MNPs and (c) Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs.

The XRD patterns of Fe_3O_4, Fe_3O_4@PDA and Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs are shown in Fig. S3. Common peaks were observed at 18.1°, 30.2°, 35.6°, 36.2°, 43.4°, 53.8°, 57.2°, and 62.8°, which were assigned to (111), (220), (311), (222), (400), (422), (511), and (440) planes, confirming the cubic crystallinity of the magnetite Fe_3O_4 nanoparticle core compared with standard XRD peaks (JCPDS No.19-0629)[1]. Surface modifications with PDA did not result in phase change of the Fe_3O_4 particles[2,3]. However, the XRD peaks of Fe_3O_4@PDA@poly(DVB-co-NVP) were broader and lower compared with those of Fe_3O_4@PDA. This phenomenon is likely because the additional poly(DVB-co-NVP) coating on the surface reduce and cover up the intensities of the corresponding peaks[4]. It can be concluded that the magnetic particles were successfully fabricated.

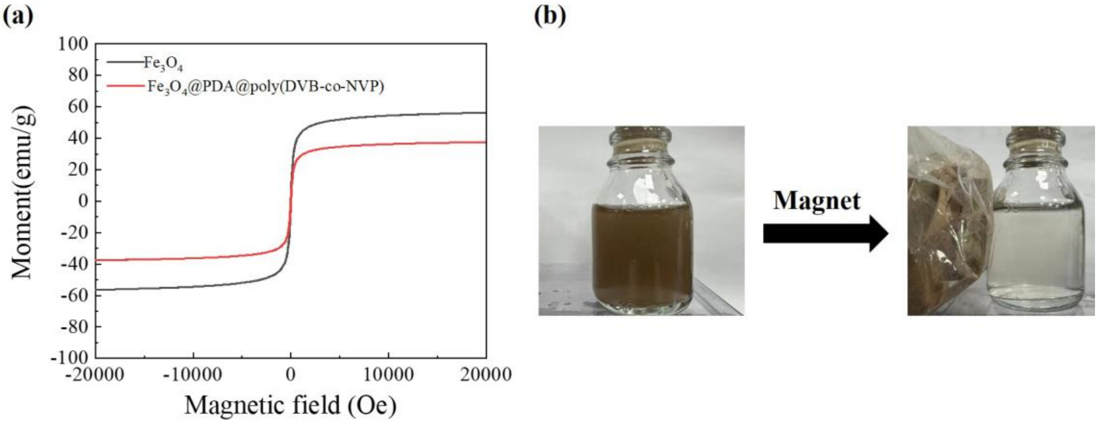

Fig. S4. (a) magnetization curves of Fe_3O_4 MNPs and Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs. (b) Magnetic separation of Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs.

Fig. S4(a) shows the magnetic properties of Fe_3O_4 MNPs and Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs measured by VSM at a temperature of 300K. The practical saturation magnetization of Fe_3O_4 MNPs and Fe_3O_4@PDA@poly(DVB-co-NVP) is calculated at 56.33 and 37.38 emu/g. From the data, it can be seen that after coating and fabrication of Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs, the actual saturation magnetization showed a tendency of decrease. Though Fe_3O_4@PDA@poly(DVB-co-NVP) MNPs exhibited a compromised magnetism compared to Fe_3O_4, both of them could be readily separated from solution by applying a magnet as shown in Fig. S4(b), supporting their application as MSPE adsorbents.

Table S1. Real sample analysis

Samples	MDMB-FUBICA	4CN-CUMYL-BUTINACA	5F-MDMB-PICA	MDMB-4en-PINACA	ADB-4en-PINACA	5F-EMB-PICA	AMB-FUBINACA	ADB-BUTINACA	4F-MDMB-BUTICA
S1	-	-	-	-	-	-	-	-	-
S2	-	-	-	-	-	-	-	-	-
S3	-	-	-	-	-	-	-	-	-
S4	-	-	-	-	-	-	-	-	-
S5	-	0.15	-	-	-	-	-	-	-
S6	-	-	-	-	-	-	-	-	-
S7	-	-	-	-	-	-	-	-	-
S8	-	-	-	-	-	-	-	-	-
S9	-	0.11	-	-	-	-	-	-	-
S10	-	<LOQ	-	-	-	-	-	-	-
S11	-	-	<LOQ	<LOQ	-	-	-	-	-
S12	-	-	<LOQ	<LOQ	-	-	-	-	-

References

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