*polymers*

*Supplementary Material*

# Bio-Based and Robust Polydopamine Coated Nanocellulose/ Amyloid Composite Aerogel for Fast and Wide-Spectrum Water Purification

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**Table S1.** Source materials used four the CpA aerogel synthesis and the adsorptions experiments.

| Chemical | Company |
|---|---|
| cellulose nanofibrils (3 w%) | American process |
| amyloid fibrils (6 wt %) | Hi-Aspect Ltd. |
| dopamine hydrochloride | Sigma–Aldrich |
| sodium periodate | Sigma–Aldrich |
| sodium hydroxide | Sigma–Aldrich |
| nitric acid (60%) | Sigma–Aldrich |
| Trizma base buffer | Sigma–Aldrich |
| copper sulphate | Sigma–Aldrich |
| lead nitrate | Sigma–Aldrich |
| Rhodamine Blue (RB) | Sigma–Aldrich |
| Malachite Green (MG) | Sigma–Aldrich |
| Cristal Violet (CV) | Sigma–Aldrich |
| Acid Fuchsin (AF) | Sigma–Aldrich |
| Methyl Orange (MO) | Sigma–Aldrich |
| Acriflavine (AC) | Sigma–Aldrich |
| Atrazine | Ici crop care |
| Bisphenol A | Sigma–Aldrich |
| Ibuprofen | Sigma–Aldrich |

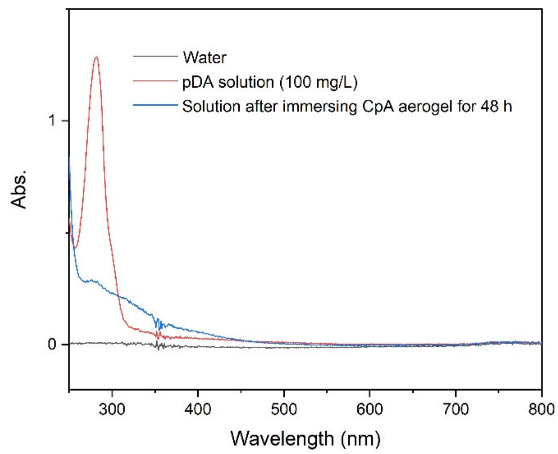


**Figure S1.** UV-visible spectrum of pure water, pDA solution and the solution after immersing CpA aerogel for 48 h. .

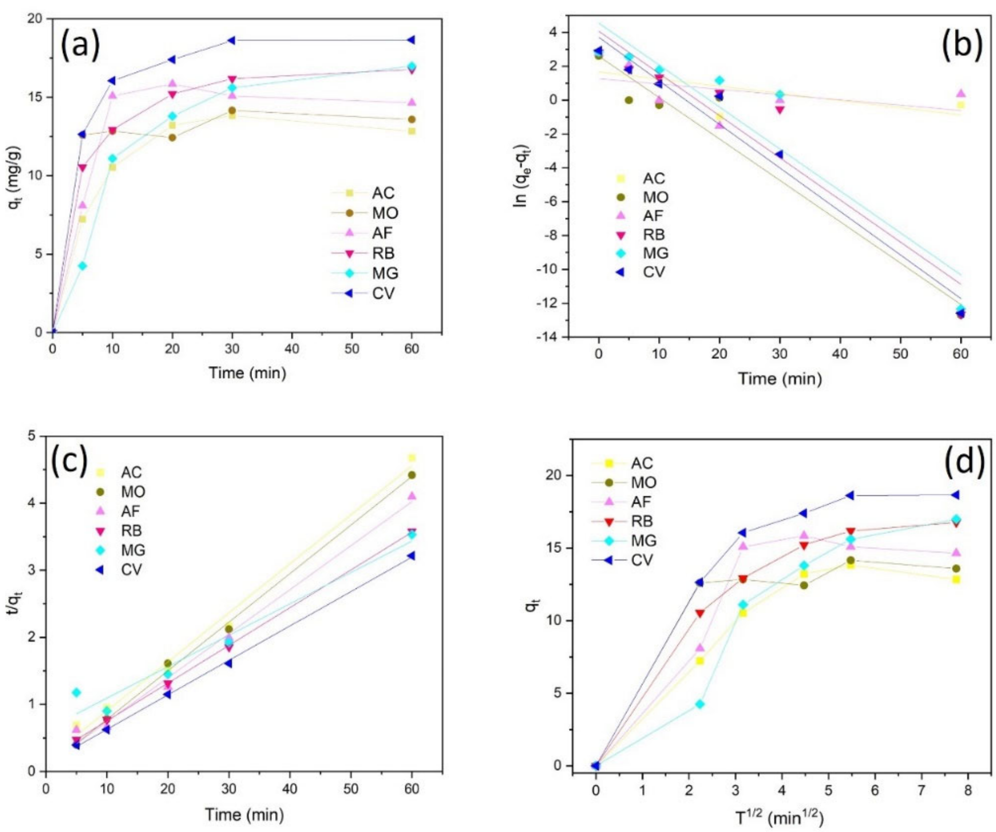


**Figure S2.** (**a**) Adsorption capability of dyes by the CpA aerogel in function of time. (**b**) The pseudo-first-order kinetic model fitting curve of dyes on the aerogel. (**c**) The pseudo-second-order kinetic model fitting curve of dyes on the aerogel. (**d**) Intra-particle diffusion model for dyes onto the aerogel.

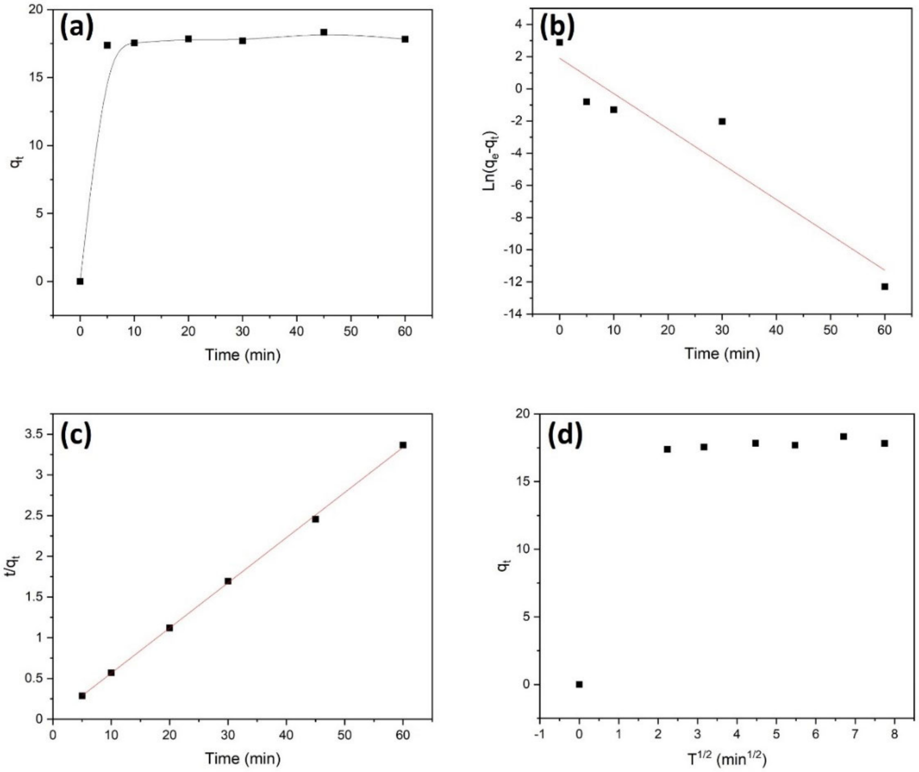


**Figure S3.** (**a**) Adsorption capability of Pb(II) ions by CpA aerogel in function of time. (**b**) The pseudo-first-order kinetic model fitting curve of Pb(II) ions on the aerogel. (**c**) The pseudo-second-order kinetic model fitting curve of Pb(II) ions on the aerogel. (**d**) Intra-particle diffusion model for Pb(II) ions onto the aerogel.

**Table S2.** Density and porosity of freeze dried CpA aerogels from freezing at different temperatures.

| Frozen temperature (°C) | Density ($mg/cm^3$) | Porosity (%) |
|---|---|---|
| −80 | 76.024 | 90.056 |
| −196 (liquid nitrogen) | 67.900 | 91.119 |

**Table S3.** Parameters of the pseudo-first-order and pseudo-second-order models for organics adsorption on the aerogel.

| | $q_e$ (experimental) | | $R^2$ | $q_e$ | $k_1$ |
|---|---|---|---|---|---|
| Atrazine | 0.0360 | y=-0.10899x-5.121 | -0.15393 | | |
| Bisphenol A | 0.0958 | y=-0.14667x-3.47869 | 0.39084 | | |
| Ibuprofen | 0.0823 | y=-0.1541x-3.88557 | 0.27801 | | |
| | **$q_e$ (experimental)** | | **$R^2$** | **$q_e$** | **$k_2$** |
| Atrazine | 0.0360 | y=27.61217x+13.47533 | 0.99924 | 0.0362 | 763.1024 |
| Bisphenol A | 0.0958 | y=10.35315x+5.36855 | 0.99990 | 0.0965 | 107.3854 |
| Ibuprofen | 0.0823 | y=12.09586x+4.00989 | 0.99994 | 0.0827 | 146.214 |

**Table S4.** Parameters of the pseudo-first-order model for dyes adsorption on the aerogel.

| | $q_e$ (experimental) | | $R^2$ | $q_e$ | $k_1$ |
|---|---|---|---|---|---|
| AC | 13.5826 | y=-0.04242x+1.66581 | 0.29719 | 5.2900 | 0.04242 |
| MO | 13.5803 | y=-0.2443x+2.59156 | 0.92344 | 13.3506 | 0.2443 |
| AF | 16.0656 | y=-0.03126x+1.25976 | -0.00834 | 3.52458 | 0.03126 |
| RB | 16.7677 | Y=-0.24896x+4.06284 | 0.88097 | 58.1391 | 0.24896 |
| MG | 16.9858 | y=-0.24773x+5.54571 | 0.84890 | 256.1364 | 0.24773 |
| CV | 18.6585 | y=-0.25706x+3.70838 | 0.96057 | 40.7877 | 0.25706 |

**Table S5.** Parameters of the pseudo-second-order model for dyes adsorption on the aerogel.

| | $q_e$ (experimental) | | $R^2$ | $q_e$ | $k_2$ |
|---|---|---|---|---|---|
| AC | 13.5826 | y=0.07306x+0.17344 | 0.98796 | 13.6874 | 0.0308 |
| MO | 13.5803 | y=0.0724x+0.05448 | 0.99684 | 13.8122 | 0.0962 |
| AF | 16.0656 | y=0.06564x+0.08484 | 0.9877 | 15.2346 | 0.0508 |
| RB | 16.7677 | y=0.05624x+0.19296 | 0.99975 | 17.7809 | 0.0134 |
| MG | 16.9858 | y=0.04681x+0.62618 | 0.94479 | 21.3629 | 0.0035 |
| CV | 18.6585 | y=0.05137X+0.11468 | 0.99921 | 19.4666 | 0.0230 |

**Table S6.** Parameters of the pseudo-first-order and pseudo-second-order models for Pb(II) ions adsorption on the aerogel.

| | $q_e$ (experimental) | | $R^2$ | $q_e$ | $k_1$ |
|---|---|---|---|---|---|
| pseudo-first-order | 17.8254 | y=-0.94984x+1.90089 | 0.86961 | 6.6918 | 0.94984 |
| | $q_e$ (experimental) | | $R^2$ | $q_e$ | $k_2$ |
| pseudo-second-order | 17.8254 | y=0.05545x+0.01146 | 0.9993 | 18.0342 | 0.0031 |