

Electronic Supporting Information

**MIL-53-PVDF mixed-matrix membrane for dispersive
membrane solid-phase extraction of phenoxy carboxylic
acid herbicides in environmental water sample followed by
HPLC determination**

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Chemical reagents

Materials for MOF synthesis: MIL-53 was prepared using aluminum nitrate nonahydrate ($\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$, Sinopharm Chemical Reagent Co., Ltd., China) and terephthalic acid (Tianjin Guangfu Fine Chemical Research Institute, China). The synthesis was conducted in a mixture of ultra-pure water and N,N-dimethylformamide (DMF, Aibi Chemical, Shanghai, China).

Materials for membrane fabrication: The MIL-53 membrane was prepared by mixing polyvinylidene fluoride (PVDF, Taiyuan Lizhiyuan Battery Sales Department, China) with DMF.

Solvents and chemicals: Acetone (Sinopharm Chemical Reagent Co., Ltd., China) and dichloromethane (Aibi Chemical, Shanghai, China) were of analytical grade. Phosphoric acid and hydrochloric acid (guaranteed reagent grade) were purchased from Tianjin Kaixin Chemical Co., Ltd. Methanol and acetonitrile (chromatographic grade) were obtained from ANPEL Laboratory Technologies (Shanghai) Inc. Additionally, solid sodium hydroxide (Tianjin Hengxing Chemical Reagent Manufacturing Co., Ltd.) and sodium chloride (Aibi Chemical, Shanghai, China) were also of analytical grade.

Standard solutions: Solid standards of the phenoxy-carboxylic acid herbicides 2,4-D, MCPA, 2,4-DP, and 2,4-DB were purchased from Aladdin Reagent (Shanghai) Co., Ltd. A mixed standard stock solution with a concentration of $1000 \text{ mg} \cdot \text{L}^{-1}$ for each compound was prepared in pure methanol and stored at $-20 \text{ }^\circ\text{C}$. This stock solution was diluted with methanol to obtain a $100 \text{ mg} \cdot \text{L}^{-1}$ mixed working standard solution, which was further diluted to appropriate concentrations as needed for the experiments.

Experimental water: All aqueous solutions were prepared using ultra-pure water ($18.2 \text{ M}\Omega \cdot \text{cm}$) produced by a Synergy 185 water purification system (Millipore, USA).