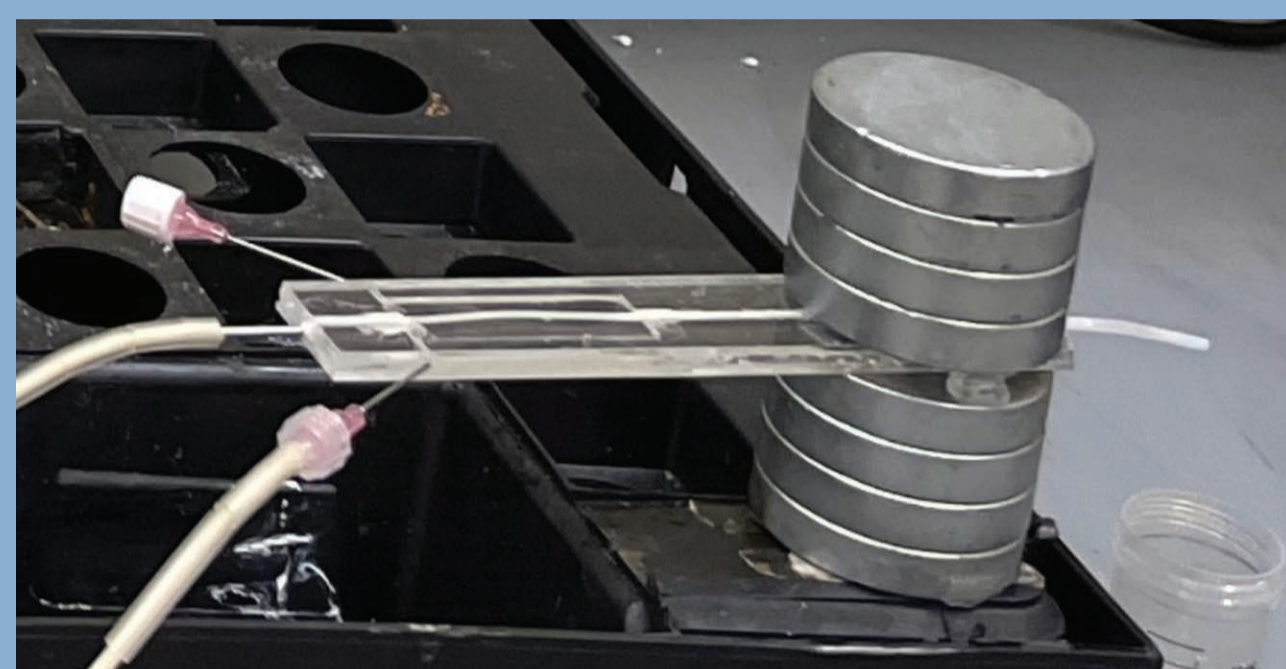
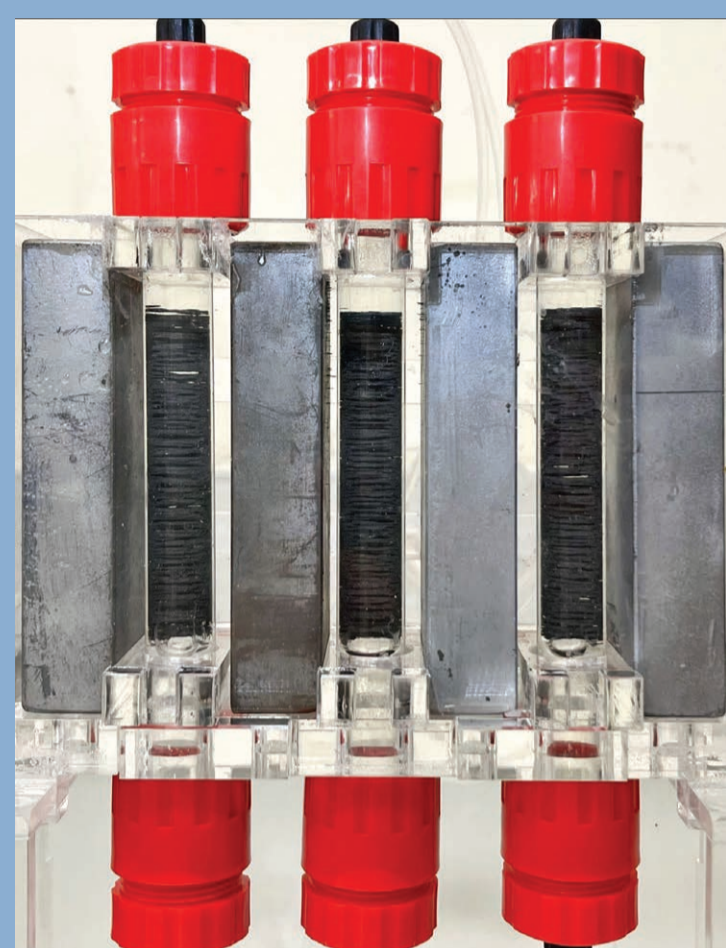


Water Treatment System Using a Magnetic Confinement Method

磁約束水處理系統



Hollow fiber membrane chemical reactor



Magnetic confinement-enabled column reactor (MCCR)



Low/free energy input



Sustainable decontamination



Magnetic field-enhanced processes



Low-cost purification



Wide-spectrum decontamination

This groundbreaking water treatment system offers an efficient and sustainable solution for decontaminating complex waters. It uses parallel magnetic fields to enable targeted reactions, resulting in effective decontamination. At its core, the system consists of a flow-through chemical reactor and permanent rubidium magnets. Its key feature is the assembly of magnetic (catalytic) materials into forest-like arrays of porous needles. These structures enable specific reactions that effectively remove contaminants from water. Two specific structural configurations are developed to address typical water treatment scenarios. The first configuration involves a hollow fibre membrane chemical reactor, which integrates sequential membrane separation, and high and sustainable Fenton-like catalysis. This design enables the system to achieve high and synergistic wide-spectrum decontamination. The second configuration centres around a magnetic confinement-enabled zerovalent iron column reactor, coupled with periodic ultrasonic depassivation. This setup excels in removing arsenic from water by reacting with in situ generated iron (oxyhydr)oxides, which result from the oxidative corrosion of zerovalent iron. This novel water treatment system, enabled by magnetic confinement engineering, is also promising for the efficient and sustainable decontamination of industrial wastewater.

這個突破性的磁約束水處理系統，是一個基於平行磁場而構建的新型水處理系統，具有高效及可持續去污性能。這個系統由流通式反應器和永久性銻磁鐵組成，其特點是將磁性(催化)材料在平行磁場中自動組裝成多孔針狀的森林陣列結構。這種結構能促成特定的化學反應以有效除去水中的污染物。這個系統包含了兩個創新的結構配置模式，可應對典型的水處理場景。模式一為真空纖維膜化學反應器，它集成了次序膜過濾與類芬頓催化過程，可以實現高效且持續協同的廣譜污染物淨化。模式二為磁約束柱反應器，藉助零價鐵氧化性腐蝕過程原位產生的鐵氫氧化物，並耦合周期性超聲波去鈍化策略，以實現高效持續除砷。磁約束水處理系統有望在未來應用於工業水處理領域。



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