

Development of Polymer-Iron Oxide Nanofiber Composites for Enhanced Lead Removal in Point-of-Use Water Treatment

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Precursor Sol Gel:

Iron oxide, Nylon, and PTA were dissolved in DMF

Electrospinning

Sol gel is emitted via syringe into a controlled environment (e.g., pumping speed, constant RH, temperature, voltage and rotator speed).

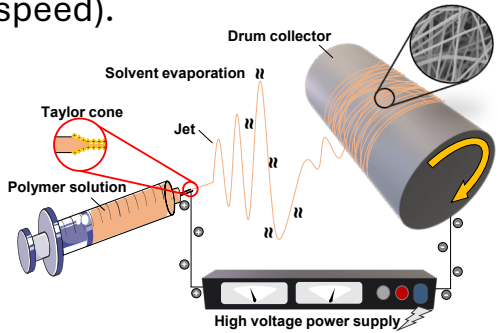


Fig. 1. The schematic of nanofibers via electrospinning



Fig. 2. PTA assisted Nylon-iron oxide nanofiber sheet and its SEM image.

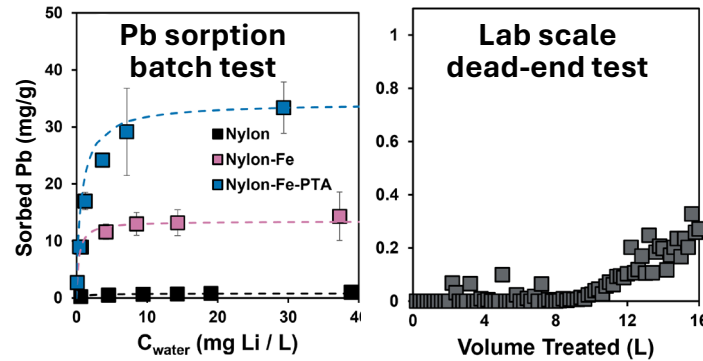


Fig. 3. Lead uptake test ($C_i=1-40$ ppm; pH 6.5; 0.5 g mat/L; contact time=24 h) and filter-through test ($C_i=150$ ppb, 20 mL/min (952.4 LMH), 12.6 cm², pH 6.5)

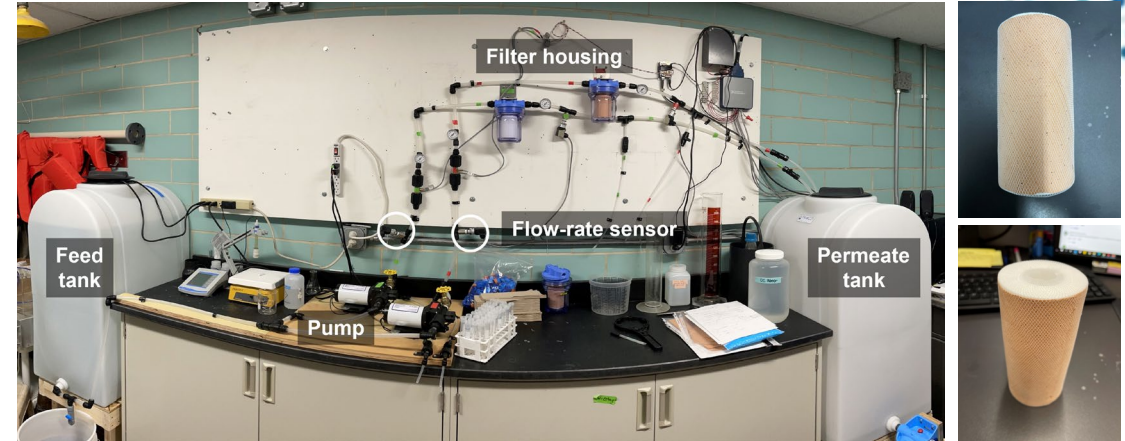


Fig. 4. The prototype POU test rig. 60 gal, effective surface area of 250 cm², 150 ppb Pb, pH 6.5, and 1 gal/min.

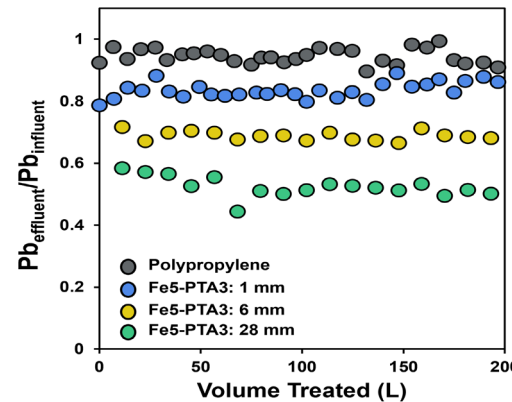


Fig. 5. Normalized Pb concentration in single pass-through prototype POU unit

Despite simple wrapping around a PP support, 28 mm of Nylon nanofiber sheet exhibits 50% Pb removal.

We expect that a more robust prototype design (e.g., thicker and more tightly packed filtration layers) will improve Pb removal.