

Supplementary Information

A highly efficient uranium grabber derived from acrylic fiber for extracting uranium from seawater

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Estimate the amidoxime/carboxylate ratio and nitrile peak intensity in the fiber adsorbent

We estimate the ratio amidoxime/COO⁻ and -CN base on the decrease in the -CN peak intensity shown in Fig 1S. The decrease of the -CN peak is 50% after the amidoximation reaction (1st step). About 46% amidoxime was produced because the acrylic fiber contains 92% acrylonitrile and 8% methyl acrylate monomers. The decrease of the -CN peak intensity is another 40% after the alkaline hydrolysis reaction (2nd step) with about 10% of -CN remaining in the fiber. The actual percent of -CN in the fiber is 9% because the fiber is made of 92% acrylonitrile and 8% methyl acrylate. In the 2nd step, about 37% of carboxylate was produced from the -CN group. Moreover, both ester and hydroxamic acid groups are converted to carboxylate (8%) during the alkaline hydrolysis reaction (2nd step).^{1, 2} The final distribution of the

chemical groups in the fiber adsorbent is estimated to be 46% amidoxime, 45% carboxylate, and 9% nitrile.

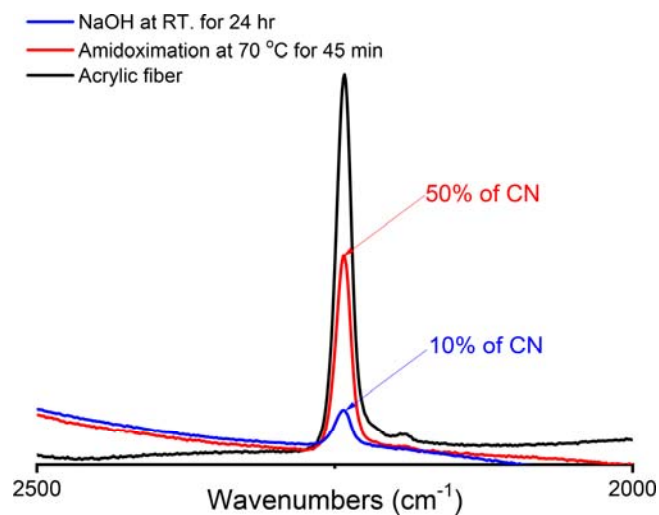


Fig. 1S The nitrile ($\text{—C}\equiv\text{N}$) peak in FTIR spectra of the original acrylic fiber (black), after amidoximation (step 1, red), and after NaOH treatment (step 2, blue). (The spectra were normalized to the $\text{—CH}_2\text{—}$ in-plane bending or scissoring band ($\delta_s\text{CH}_2$) at 1450 cm^{-1})

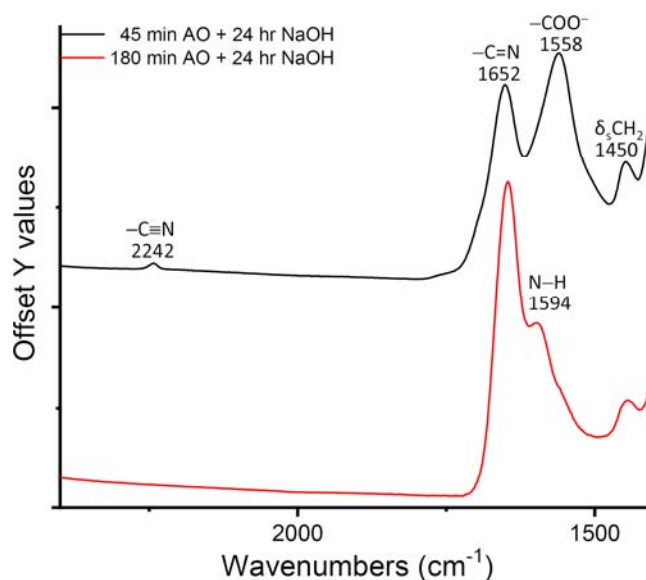


Fig. 2S FTIR spectra of different amidoximation time (black, 45 min; red, 180 min) of polymer fiber adsorbents. (The spectra were normalized to the $\text{—CH}_2\text{—}$ in-plane bending or scissoring band ($\delta_s\text{CH}_2$) at 1450 cm^{-1})

References

1. M. Smith, *March's advanced organic chemistry : reactions, mechanisms, and structure*, Wiley, Hoboken, New Jersey, 2013.
2. K. K. Ghosh, S. K. Patle and S. S. Thakur, *Chem. Eng. Commun.*, 2006, **193**, 363-369.