Chinese Chemical Letters Vol. 14, No. 6, pp 609 – 610, 2003
http://www.imm.ac.cn/journal/ccl.html

The Application of Polytetrafluoroethylene (PTFE) Fiber Grafted Acrylic Acid as a Cation Exchanger for Removing Cu^{2+}

Zheng Pu ZHANG[1]*, Zhi Peng WANG[1], Bao Gui ZHANG[2], Yan Geng ZHANG[3]

[1]The State Key Lab. of Adsorption and Separation of Functional Polymer Materials, Nankai University, Tianjin 300071
[2]Environmental Science College, Nankai University, Tianjin 300071
[3]The Tianjin Institute of Technological Physics, Tianjin 300192

Abstract: The polytetrafluoroethylene fiber grafted acrylic acid was used as a cation exchanger. The exchange capacity of the cation fiber is 3.06 mmol/g. The maximum Cu^{2+} adsorption capacity is 107.48 mg/g. It could be desorbed completely by 1mol/L HCl.

Keywords: Polytetrafluoroethylene fiber, acrylic acid grafting, Cu^{2+} adsorption.

There are many advantages for ion exchange fibers prepared from the natural fiber, *i.e*. the strong hydrophilicity, the large surface area and the high speed of both adsorption and desorption for organic compounds and metal ions. It has been used widely in biochemical separation, analysis, the recovery of precious metals and the environmental protection[1-2]. But its application still is limited because of the poor anticorrosion property.

Polytetrafluoroethylene (PTFE) possesses excellent chemical stability, and can be used in very harsh conditions. Recently, a novel cation exchanger fiber was prepared by irradiating grafting of acrylic acid at the surface of the PTFE. The novel cation exchanger fiber not only has the advantages of the commercial cation exchanger fiber, but also has a good corrosion resistance.

The pH titration curve of the grafted fiber was given in **Figure 1**. It showed, for PTFE the titration curve has a sudden change from pH 6 to pH 10. It is completely different from the typical weak acid exchange resin (WAE).

As a heavy metal ion, Cu^{2+} is poisonous and harmful to human health, even the concentration of Cu^{2+} in drinking water is only at ppm grade. Ion exchange and adsorption are efficient methods for removing micro quantity of Cu^{2+} in water[3-4].

This novel grafted PTFE fiber was used to remove Cu^{2+} at different pH condition. The best pH value for the Cu^{2+} adsorption is at 3∼5. The highest adsorption capacity for Cu^{2+} is 107.48 mg/g at pH 5 (**Figure 2**). The fiber could be regenerated with 1 mol/L HCl (**Figure 3**).

* E-mail: Zhangzp@nankai.edu.cn

Figure 1 The comparison of the two pH titration curves of PTFE fiber and WAE resins

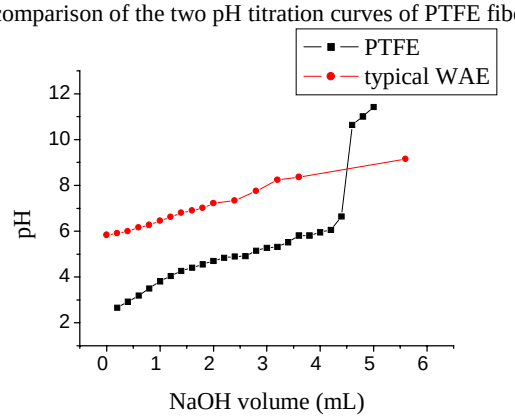
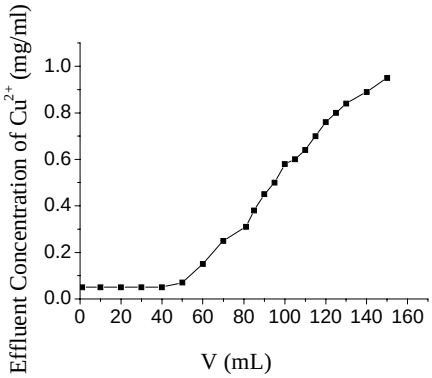
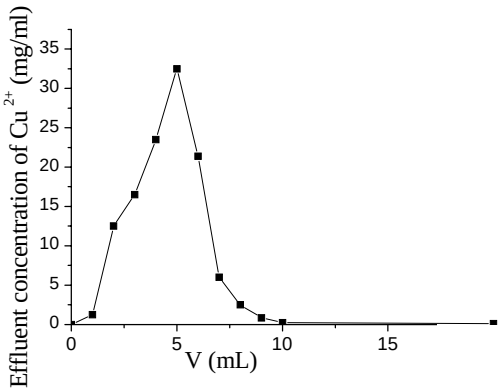


Figure 2 The dynamic adsorption of Cu^{2+} by grafted PTFE fiber



The adsorption condition:
$[Cu^{2+}]_0$=1 mg/ml; pH=5;
SV(Speed Velocity)=7.5 BV/h

Figure 3 The desorption curve of grafted PTFE fiber



The desorption condition: SV=15BV/h

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Received 27 August, 2002