Study on the preparation and properties of Cu(II) molecularly imprinted membrane (Cu(II)/MIM/PVDF)

Xiaojiao Yu a,*, Song Kou a, Qian Yang a, Yingjuan Zhao a, Yuchen Wei b, Binghua Yao a

a School of Science, Xi’an University of Technology, No. 5 South Jinhua Road, Xi’an 710048, China, Tel./Fax: +86 29 82066360; emails: yxjw@xaut.edu.cn (X. Yu), 442505576@qq.com (S. Kou), 914730841@qq.com (Q. Yang), 53091525@qq.com (Y. Zhao), bhyao@xaut.edu.cn (B. Yao)
b School of Science, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong, China, Tel. +00852 53449506; email: wych82313102@gmail.com (Y. Wei)

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A B S T R A C T

A Cu(II) molecularly imprinted modified membrane is prepared by graft polymerization of α-methacrylic acid on the surface of a polyvinylidene fluoride (PVDF) membrane. The modified membrane is characterized using scanning electron microscope, X-ray diffraction, attenuated total reflection–Fourier-transform infrared spectrometer, X-ray photoelectron spectrophotometer, contact angle, thermogravimetric analysis–differential thermal analysis and an electronic tensile testing machine. Permeability and selectivity of the modified membrane are also evaluated via pure water flux and transfer experiments. The results indicate that the microvoids of the modified membrane surface are uniformly distributed and change obviously, the amorphous state area of modified membrane increases, and the original crystal characteristics of the PVDF membrane are maintained. The α-methacrylic acid grafts onto PVDF membrane surface and the molecularly imprinted polymer layer are combined with PVDF through C–O bond. The hydrophobicity of modified membrane decreases and the surface energy increases. The mechanical properties of the membrane become weak after modification. The permeability coefficient of the modified membrane is higher than that of a PVDF membrane. The transfer rate of Cu(II) can reach 92% through the Cu(II) molecularly imprinted modified membrane, whereas the transfer rate of Mn(II), Co(II) and Ni(II) is less than 10%. The modified membrane shows excellent selectivity and permeability for Cu(II).

Keywords: Polyvinylidene fluoride membrane; Surface modification; Molecularly imprinted modified membrane; Performance