Removal of Pesticides by Nanofiltration：Effect of the Water Matrix and Physico-chemical Characteristics of Membranes

游志賢、柯雅雯

E-mail: 9707462@mail.dyu.edu.tw

ABSTRACT

The objective of this research is to study the effects of water matrix and different NF membranes (NF90, NF270, and NTR) on the rejection properties of the selected pesticides, including Atrazine, Diuron, Dichiorvos, Isoproturon, Monocrotophos, Simazin, and Simetryn. The influence of the physico-chemical characteristics of pesticides on the rejection rate is also investigated. Results showed that the rejection rate of pesticides was in the order of NF90> NF270> NTR. Both the solute and solvent flux will increase with the increase of applied pressure; while the rejection rate is dependent on the relative increments of both flux. Since Diuron has a greater molecular weight and molecular width, steric exclusion is one of the major rejection mechanisms. For the NTR membranes, Pesticides with a greater value of LogKow or with a lower value of pKa will exhibit a greater value of rejection rate. When the co-existing ions exist, structure of the membrane becomes more compact, and consequently the permeate flux will decrease. The rejection rate of Simazin, Simetryn, and Dichiorvos increased when the concentration of NaCl and Na2SO4 were 39.5 mg/L. As for the effect of water matrix on the rejection rate, the rejection rate of pesticide decreased with the increase of background composition. Rejection rate of Atrazine and Simazin increased due to the electrostatic repulsion on the membrane surface. On the other hand, rejection rate of Dichiorvos and Simetryn increased because of the significant steric exclusion. As for Diuron, Isoproturon, and Monocrotophos, their rejection rates decreased with the existence of background components.

Keywords : NF90 ; NF270 ; NTR ; Atrazine ; Diuron ; Dichiorvos ; Isoproturon ; Monocrotophos ; Simazin ; Simetryn ; water matrix ; co-existing ions

Table of Contents

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