역삼투막을 이용한 지표수의 비소 제거에 관한 연구

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A study of removal arsenic in the surface water by using Reverse Osmosis

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1. Introduction

This paper was undertaken to study the separate arsenic from arsenic mixture by flat plate type module and sprial wound type module that use station reverse osmosis membrane. Pollution of arsenic can influence directly to ecosystem and human in surface water. The arsenic pollution is reported already in Thailand (Williams et al . 1998), Argentina, Chile, China, Mexico etc. in this surface water.

Pressure that is applied flat plate type module and spiral wound type module operated in each 1 - 10 kgf/cm and keeps equally and experimented other same condition. Made arsenic mixture to handle arsenic in RO membrane. First, experimented the rejection of arsenic because put arsenic in ultrawater to regulate pH and change pH because mixing NaOH.

The Reverse osmosis(RO) is one of the technologies available for removal of arsenic low pressure operation of the RO process one problem in lower pressure operation is that rejection in the case of reverse osmosis(RO). RO membrane can be performed effectively when treating arsenic in the form of As.

In the present paper, the following are studied: (1) comparison of the performance for removal arsenic from a arsenic waters, and (2) evaluation for removal arsenic at different pH, arsenic removal, arsenic concentration from operation pressure, temperature, pH.

2. Experimental

In this studies, the spiral wound type membrane module can be manufactured by Film TEC cooperated of the Polyamide TW 30 RO membrane which has materials that can be appeared relatively a design of the spiral wound type module. Also, Flat plate type module can be manufactured by stainless steel cell that used RO TEC polyamid membrane.

Normal temperature to 10 atm. Feed tank manufactured by stain less by 20L capacity so that length, width and height may become each 30㎝, 25㎝, and 15㎝ and pump used Shurflo Pump. Used grinding seat in support style of membrane in Flat plate type module and inserted rubber O-ring for perfect close adhesion because connecting Volt cell.

Module's pressure that is used in device that is used in a station saturation filtration experiment regulated pressure by valve, and established manometer (0~10 kgf/cm^2) establishing adjustment valve in front of module in 10atm.

Permeation through station saturation film measured permeate's mass through Mass balance and this permeate measured concentration by Arsenic tester. The membrane pretreated pure water was used as the feed for reverse osmosis system. All experiments were carried out in a reverse osmosis rig at ambient temperature (25℃±1℃).

Changed pH to measure the exclusion rate of arsenic and permeate's concentration according to change of pressure and measured As' the exclusion rate and concentration under fixed driving condition.

The pH of the solution was adjusted by NaOH at 4, 5, 6, 7, 8, 9, and 10, respectively. We Performed the RO-membrane provided removal arsenic. RO-membrane is an effective treatment process for removal of As according to laboratory.

3. Results and discussion

Fig. 1~2. appeared permeate's the rejection by pressure in feed solution's concentration in each module. Pressure is higher, the rejection of two modules appeared high. The rejection of spiral wound type module that is RO membrane appeared than flat plate type module high. In this case of RO membranes an inflection takes place at pH 10.0, Which continutes to show

percentages of rejction equivalent to a pH more than 8.0. The percentages rejection was 85% or higher at pH around 10.0, giving 50% or higher in the neutral pH range of 6~7. A control experiment of NaOH in the pH range 4~10. The As rejection percentages for spiral wound type module of experiments carried out for a rejection percentages of respectlly 76%, 80% at 25℃.

Fig. 3~4. appeared As' the rejection by pH's change in concentration of fixed pressure (10atm) and fixed feed solution in each module. When feed solution's temperature is 40℃, all each modules showed the highest rejection. The rejection of spiral wound type module percentages significantly increased by raising the temperature to 40℃, attaning 90% rejection. However, if temperature becomes more than 40℃, the rejection dropped. Spiral wound type module appeared the quantity high rejection than flat plate type module again.

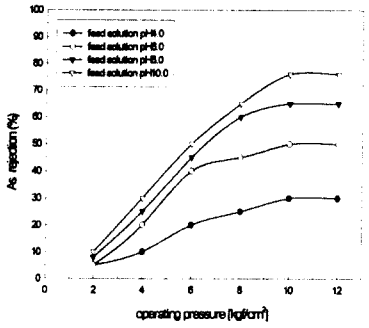

Fig. 1. Rejection of variety of feed solution pH vs. applied pressure of flat plate type module

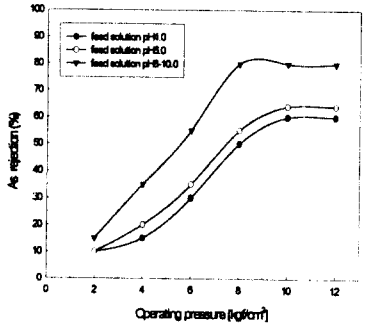

Fig. 2. Rejection of variety of feed solution pH vs. applied pressure of spiral wound type module

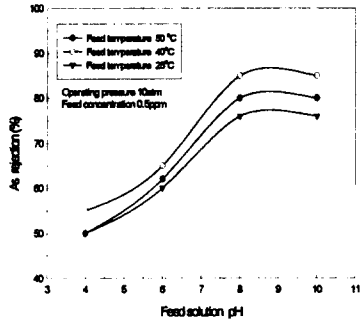

Fig. 3. Rejection of variety of feed temperature vs. applied pH of Flat plate type module

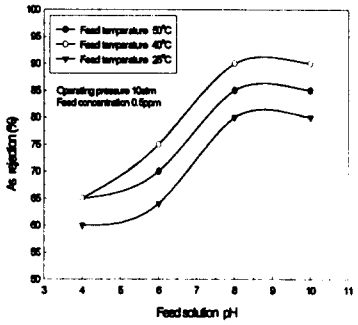

Fig. 4. Rejection of variety of feed temperature vs. applied pH of Spiral wound type module

4. Reference

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