

# NASA TECH BRIEF

## *Langley Research Center*



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### Water Purification by Reverse Osmosis Using Heterocyclic Polymer Membranes

Recent tests conducted using direct osmosis measurements of water, salt and urea fluxes through Pyrrone membranes, indicate Pyrrones may outperform cellulose acetate membranes in water purification by reverse osmosis. Successful fabrication of asymmetric Pyrrone membranes could lead to substantial improvements in water purification.

The Pyrrone (polyimidazopyrrolone) polymers are a new class of thermally stable, radiation and chemical resistant aromatic-heterocyclic polymers. In addition to having a high water absorptivity, Pyrrones feature greater chemical and mechanical durability than cellulose acetate. They have a high compressive strength and the ratio of intrinsic water to salt permeabilities are 100 times greater than ratios calculated from cellulose acetate data. The salt rejection is much higher at lower applied pressures which facilitate higher recoveries of purified water at lower pressures than have been attainable. Water flux, salt rejection, and desalinated water recovery can be further increased by using Pyrrones that are more porous and permeable to water than cellulose acetate as they can withstand similar pressures because of greater strength.

This study indicates the need for further testing but also indicates the superiority of the Pyrrone polymer at this point over the best reverse osmosis membrane developed to date. Absolute water flux is low, and dramatic improvement of it is needed. It should be noted however, that the application of Pyrrone polymer is limited by the complex and costly production process involved in their manufacture.

This information and additional information contained in the reference material may be of special use and/or interest to agencies combating water pollution, the office of saline water (Dept. of the Interior), and the manufacturers of polymer membranes.

#### Notes:

1. The following documentation is available from:  
National Technical Information Service  
Operations Division  
Springfield, Virginia 22151  
Single document price \$3.00  
(or microfiche \$0.95)  
Reference: NASA CR-1648 (N70-38436) Evaluation of Pyrrones as Membranes
2. Requests for further information may be directed to:  
Technology Utilization Officer  
Langley Research Center  
Hampton, Virginia 23365  
Reference: TSP72-10230

#### Patent status:

No patent action is contemplated by NASA.

Source: H. Scott of  
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