

Acetic acid dehydration using HybSi[®]-AR membranes

Authors

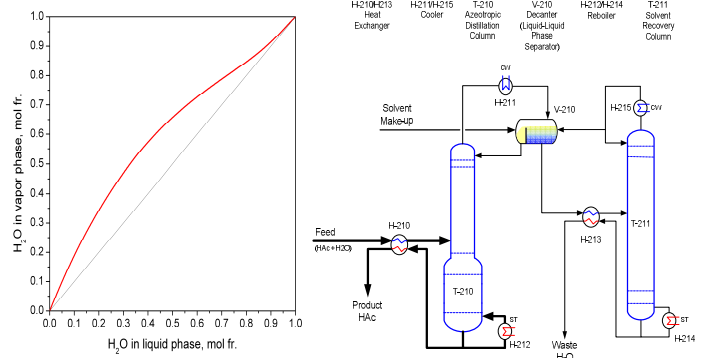
H.M. van Veen¹, M.M.A. van Tuel¹, Y.C. van Delft¹,
E.R. van Selow¹, A. de Groot¹

Corresponding author: vanveen@ecn.nl

Introduction

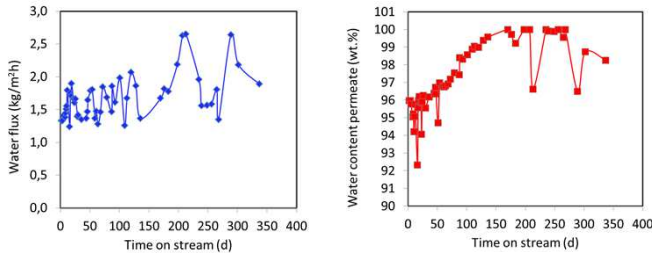
Pervaporation based process for energy efficient dehydration of acetic acid (HAc):

- HAc: important commodity chemical
- HAc - H₂O: close boiling points and narrow VLE curve
- Distillation + liquid-liquid extraction can reduce the energy consumption by 20-40%, though large recycle is needed
- Further efficiency improvement by pervaporation to separate main part of the water
- New HybSi[®]-Acid Resistant membrane developed with high acid stability and enabling high temperature use, see www.hybsi.com



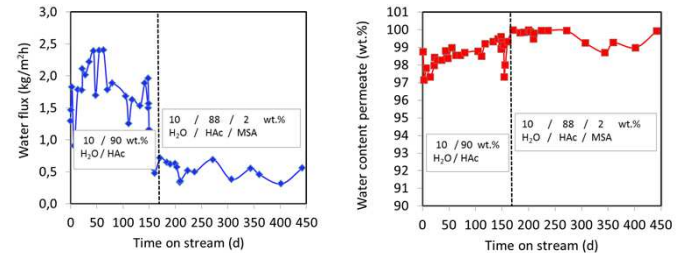
Increased acid resistance

- Feed: 10 wt.% H₂O in HAc at ~ 100°C
- Membrane performance is good and even increases during > 300 days of continuous testing



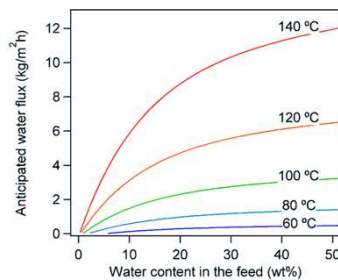
Further acid resistance

- Add 2 wt.% Methane Sulphonic Acid = decrease pH to ~ 0.5
- Reduced flux due to reduced driving force
- Stable membrane performance for > 300 days continuous operation

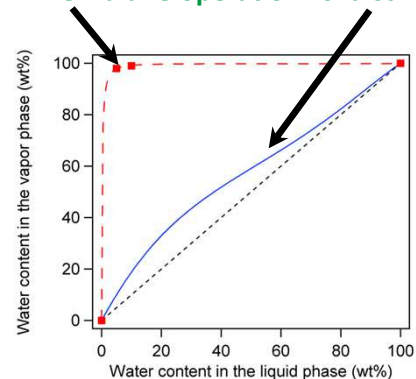


Outlook

- High selectivity one step purification
- High fluxes possible under industrial conditions
- Membrane resistant against selected media and conditions
- Potential use in esterification and acetalisation reactions: conversion increase by water removal and equilibrium shift



HybSi[®]-AR membrane operation vs. distillation



Conclusions

- The new HybSi[®]-AR membrane is resistant against organic acids even at very low pH values
- Energy savings ~ 20% and few years pay back time possible in acetic acid dehydration
- Expected is that in dehydration of all kind of organic acids important process improvements are possible

Acknowledgements

Pervatech, University of Twente, STW, ISPT, RVO.nl