



## Transport of inorganic acids through polybenzimidazole (PBI) based membranes by chemo-dialysis

Yogesh J. Chendake, Ulhas K. Kharul\*

*Polymer Science and Engineering Division, National Chemical Laboratory, Pune 411008, Maharashtra, India  
Tel. +91 20 25902180/3; Fax: +91 20 25902617; email: uk.kharul@ncl.res.in*

Received 9 December 2010; Accepted 3 July 2011

---

### ABSTRACT

A process of chemo-dialysis involving poly(benzimidazole) (PBI) as a chemically active membrane material is proposed for the transport of inorganic acids. These membranes possessing basic nature selectively bind acid molecules present in the feed solution due to acid-base interactions. They are transported across the membrane by concentration gradient as the driving force. The transported acid molecules are stripped away from other side of the membrane surface by a suitable stripping agent or water. Effects of nature of feed acid ( $pK_a$ , molecular size), its concentration in the feed solution and the nature of stripping agent (base or water) on acid transport properties are presented. Membranes showed appreciable transport rates for three acids, viz.,  $H_2SO_4$ , HCl and  $HNO_3$ . The fluxes for different acids varied from 16.1 to 140.7 g/m<sup>2</sup> h under different operating conditions. Most significantly, there was no transport of non-acidic solutes such as NaCl or glucose. This could be made possible since these solutes neither get sorbed in the membrane matrix, nor does the membrane exhibit any porosity for the transport to occur through pores. This resulted in practically infinite selectivity of transported acid over the non-acidic solutes. Use of water as the stripping agent allows recycling of the acid, making the process economically attractive. Moreover, possible recovery of acid and its reuse eliminated the requirement of acid neutralization and disposal; which is a routine practice followed today. Thus, this process of chemo-dialysis is economically attractive and environmentally benign.

*Keywords:* Acid transport; Membrane; Polybenzimidazole; Chemo-dialysis; Inorganic acids; Chemical interaction

---

---

\*Corresponding author.