Abstract

The work is mainly based on the taste response study of the functionalised polymer membranes. For the purpose of taste sensing in aqueous solution, the functionalised polymer membranes require active functional groups on its surface for interaction with the analytes and optimum hydrophilicity and swelling properties as well for physical stability. Polyvinyl alcohol (PVA) and poly acrylic acid (PAA) matrices were the choices for required modifications. A series of membranes were prepared by the chemical modification of PVA through cross-linking and subsequent phosphorylation. Polyacrylic acid, popularly known as polyelectrolyte containing active carboxyl group, itself was used to prepare membrane. The other different types of membranes include PVA-PAA blend and a few polymer composites. The cross-linked PVA, PAA, and PVA-PAA blend membrane were separately taken to prepare polyaniline (PAn) composite membranes by *in situ* oxidative polymerisation of aniline hydrochloride. Similarly, PVA-poly(m-aminophenol) composite was prepared by *in situ* oxidative polymerisation of meta-aminophenol. All the membranes were evaluated by physical property measurements like moisture absorption, water absorption and contact angle measurements. The conductivity of the polyaniline (PAn) composite membranes was measured. The structural and morphological characterisation was done by FTIR, XRD and FESEM analyses. The taste response measurement in terms of electric potential was done using a potentiometry electrochemical device. The taste response characteristics of seven different membranes were evaluated primarily by measuring the temporal stability, response stability and reproducibility with different basic taste substances. The reproducibility of the taste response in terms of electrical potential of each of the membranes was evaluated on the basis of three consecutive cycles of measurements. Then the chemicals of five different basic taste groups such as NaCl (for saltiness), HCl (for sourness), quinine hydrochloride (for bitterness), sucrose (for sweetness) and ionosine monophosphate (for umami) were used to study the taste response of the seven different functionalised polymer membranes. The threshold concentrations for the taste response of different membranes towards different basic tastes are below that of human sensing. The electrical response data of the seven membranes towards different basic taste substances were analysed by statistical techniques using principal component analysis and multi discriminant analysis. The results of statistical analysis indicate that the seven membranes used in an array of a multichannel taste sensor are capable of discriminating different tastes at any concentration. The other substances of each group of basic taste substances were used to investigate the selectivity of the array of seven membranes in respect of taste and not the chemical structure.

Key words: Taste response, Functionalised polymer membranes, Chemical modification, Characterisation, Polyelectrolyte, Temporal stability, Response stability, Reproducibility.