

Carbonate ion sensing electrode membrane based on poly(vinyl chloride) and its property characteristics

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ABSTRACT

Ion selective electrode membranes based on plasticized poly(vinyl chloride) containing an ionophore and an lipophilic agent were prepared with loadings of various amounts of the plasticizer, ionophore, and lipophilic agent, and their electrochemical performance was examined.

Keywords: ion selective electrode membrane, polymer matrix, ionophore, plasticizer, plasticizer-free, lipophilic agent, glass transition temperature, mobility, ion sensor, chemical sensor

RESULTS AND DISCUSSION

In this study, we chose poly(vinyl chloride) (PVC) as a polymer matrix for an ion selective electrode membrane (ISE), bis(2-ethylhexyl) sebacate as a plasticizer, octyl and dodecyl 4-trifluoroacetyl benzoates as ionophores, and tridodecylmethylammonium chloride as a lipophilic agent. Using these plasticizer, ionophores, and lipophilic agent, a series of PVC ion selective membranes with varying the composition ingredient was prepared by solution mixing in a mutual solvent, and subsequent casting and drying. The prepared membranes were investigated their glass transition and electrochemical performance.

The glass transition temperature T_g of the PVC matrix was drastically reduced by adding the plasticizer. However, the T_g of the PVC matrix was found to be changed rather drastically by adding the lipophilic agent as well as by adding the ionophores, compared to the plasticizer loadings.

Some representative potentiometric responses of the PVC ion selective membranes are shown in Figures 1 and 2. Detailed data interpretations and discussions will be given for the scattering data analysis results.

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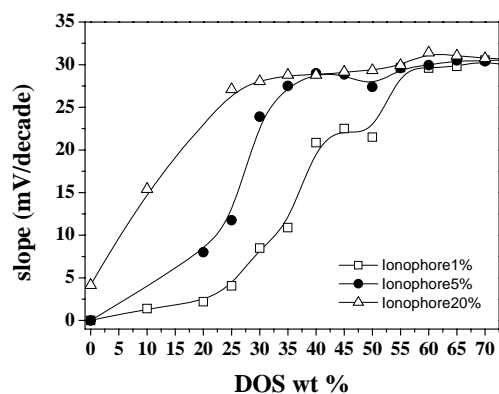


Figure 1. Variation of the slope in the potentiometric response of the ISE membrane based on PVC with varying the plasticizer loading: Ionophore concentration, 1 wt% (□), 5 wt% (●) and 20 wt% (△).

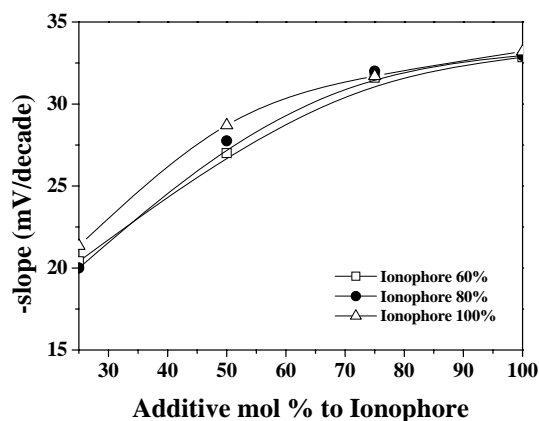


Figure 2. Variation of the slope in the potentiometric response of the ISE membrane based on plasticizer-free PVC with varying the ionophore loading.