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New Acyclic Arylether Ionophores as Potentiometric Sensors for Ca(II) and Fe(II) Ions

H. Kaur, M. Chhibber and S. K. Mittal*
School of Chemistry and Biochemistry, Thapar University, Patiala 147004, India
*Corresponding author, E-mail: smittal@thapar.edu

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Abstract Two series of arylethers with different substituents placed at para positions to the etherereal oxygens were synthesized and incorporated into poly-vinylchloride (PVC) matrix membranes to study their ionophoric potential in potentiometric ISEs. The electrodes based on diphenyl ethers (Ia and Ib) and triphenyl ethers (IIa, IIb and IIc) showed high selectivity for Fe2? and Ca2?, respectively. The electro-analytical studies on these electrodes revealed that the ionophores with hydroxymethyl group (Ib and IIb) exhibited the best potentiometric characteristics. The membrane with optimized composition; PVC: o-NPOE: ionophore (Ib): NaTPB as 33:61:3:3 (wt%) worked with a Nernstian slope of 28.1 mV per decade of Fe2? activity and a detection limit of 3.9 9 10-7 M while the membrane (IIb) with an optimised composition of 33:60:4:3 exhibited a Nernstian slope of 29 mV per decade and a detection limit of 3.2 9 10-7 M for Ca2?. Response time of the electrodes was recorded as 20 and 15 s, respectively for di and tri phenyl derivatives with a life time of at least 4 months without any measurable divergence in response characteristics over a wide pH range of 4–10. Theoretical calculations (DFT) for the host–guest interactions supported the observed substituent influence on the selectivity of ISEs. The ionophores have advantages over the earlier reported ones because of their simple synthesis, stability and easy modification of oxygen binding ability resulting from substitution.