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Investigation of sensitivity towards Zn^{2+} in curcumin based ISE by varying the pH of the medium

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Curcumin, a pigment from turmeric is a monobasic bidentate ligand with an α, β-unsaturated β-diketo moiety, which makes it an excellent chelating agent. Due to the presence of the diketo group it can undergo keto-enol tautomerism that enables curcumin to exist in different conformations depending on the environment. Metal coordination of curcumin usually happens through the enolic form and through the o-methoxy phenolic moiety. Consequently, it can form strong complexes with almost all the metals and non-metals. Since curcumin is a widely available natural compound, the investigation of its use as a ligand for the selective chelation of metal ions is advantageous. Therefore, the purpose of this study is to utilize curcumin as an ionophore in a solvent polymeric ion selective electrode (ISE). In this regard, Zn was selected as the analyte and the electrode was calibrated using different concentrations of aqueous Zn^{2+} solutions. In ISE measurements, Nernstian slope is an important diagnostic characteristic of the electrode. Generally, a monovalent ion and a divalent ion should have theoretical Nernstian slope values of 59.2 and 29.6 mV/decade respectively at 25^{0}C. According to the results, sub-Nernstian slope was observed for Zn^{2+} metal ion when ISE was used in the aqueous medium, with respect to Ag/AgCl reference electrode. Sensitivity towards chelation of Zn^{2+} was tested by varying the solvent conditions. The Nernstian slope towards chelation of Zn^{2+} was obtained by varying the Zn^{2+} concentration along with the H^+ concentration of the medium. This scenario is explained by modeling the data obtained with Nikolsky-Eisenman equation.

Keywords: Chelation, curcumin, ionophore, metal coordination, nernstian, sub-Nernstian