Influence of 4,4,4-Trifluoro-1-phenyl-1,3-butanedione on Selectivity of All-Solid-State Lithium Ion Electrode Prepared by Using 6,6-Dibenzyl-1,4,8-11-tetraoxacyclotetradecane as Ionophore and Its Application in Human Serum Analysis

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In this work, we aimed to increase the selectivity of lithium selective electrodes containing lithium ionophore VI in the membrane matrix by using 4,4,4-Trifluoro-1-phenyl-1,3-butanedione (HBTA). Potentiometric response characteristics of the prepared lithium selective electrodes were investigated. Increasing the ratio of HBTA molecule in the membrane cocktail from 0.5% to 1.5% provided a better response with respect to the lower detection limit (LDL), linear range, and selectivity. The LDL and linear range of the electrode with 1.5% HBTA were $7.6 \times 10^{-6} \text{ mol L}^{-1}$ and $1.0 \times 10^{-1} - 3.4 \times 10^{-5} \text{ mol L}^{-1}$ respectively, with a slope 54.3 mV/decade ($R^2 = 0.9998$). The potentiometric responses of all electrodes were pH-independent in the range of pH 3-12. The response time of the electrodes was less than 10 s and the lifetime was more than eight weeks. The electrode with 1.5% HBTA showed a better selectivity against sodium (1:575) and potassium (1:270) and was successfully applied for the determination of lithium levels in diluted human serum samples. The obtained potentiometric data were compared with the ICP-MS results at 98% confidence level.

Keywords: PVC membrane, all-solid-state contact electrode, bipolar disorder, lithium, potentiometry

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