

Voltammetric determination of iodide in iodized table salt using cetyltrimethylammonium bromide as ion-pairing.

ABSTRACT

In this work, voltammetric study based on cetyltrimethylammonium bromide (CTAB) as an ion-pairing agent for the determination of iodine level in iodized table salt has been explored. CTAB was used as an intermediate compound between iodide (I^-) and the electrode due to its ability to dissociate to produce cetyltrimethylammonium ions ($[CTA]^+$). The $[CTA]^+$ with a long hydrophobic alkyl chain can be directly adsorbed onto the surface of the working electrode, and this in turns coated the electrode with cationic charge and enhance the electrode ability to bind to iodide (I^-) and other molecular iodine ions. A mixture of iodide and CTAB ($[CTA]^+I^-$) was prepared and potential of 1.0 V for 60.0 s was applied to pre-concentrate the solution on the working electrode causing the $[CTA]^+I^-$ to oxidize to iodine (I_2). The produced I_2 immediately react with chloride ion (Cl^-) from the electrolyte of hydrochloric acid (HCl) to produce I_2Cl^- and form ion-pair with CTA^+ as $[CTA]^+I_2Cl^-$. The linear calibration curve of the developed method towards iodide was in the concentration range of 0.5–4.0 mg/L with sensitivity of $-1.383 \mu A \text{ mg/L}^{-1} \text{ cm}^{-2}$ ($R^2 = 0.9950$), limit of detection (LOD) of 0.3 mg/L and limit of quantification (LOQ) of 1.0 mg/L, respectively. The proposed method indicates good agreement with the standard method for iodine determination with recovery range from 95.0 to 104.3%. The developed method provided potential application as a portable on-site iodine detector.

Keyword : Commercial iodized table salt; Voltammetric; Cetyltrimethylammonium bromide (CTAB); Iodine; Screen-printed carbon electrode (SPCE).