Quantification of Iron using its Amine Complexes by Square Wave Voltammetry in Alkaline Solutions

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This work presents an electrochemical method for detecting iron, derived from corrosion processes in carbon steel structures, based on its complex ability with some organic molecules. The square wave voltammetry technique was applied using glassy carbon as a solid working electrode, and five amines were tested as complexing agents: monoethanolamine (MEA), diethanolamine (DEA), triethanolamine (TEA), monoethylamine (MELA) and triethylamine (TELA). Electrochemical tests showed peak oxidation in the presence of Fe⁽²⁺⁾ for these amines, except MELA. However, TEA was the only one to present a satisfactory determination coefficient ($R^2 = 0.9946$). The essays were performed to determine the optimal analysis conditions for frequency, pulse height and step potential. The optimized parameters were 60 Hz, 75 mV and 10 mV, respectively. Also, the results indicated that Fe^(2+/3+)-TEA complex could be applied in the chemical speciation of iron to determine the corrosion rate of carbon steel.

Keywords: Analytical Methods, Fe^(2+/3+), Amines, Square Wave Voltammetry.

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