VOLTAMMETRIC DETERMINATION OF NITROAROMATIC-TYPE ENERGETIC MATERIALS

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Electrochemical methods are important techniques finding use in the determination of explosive-type energetic materials. These methods have portable and simple equipment, and are capable of making trace determination. Energetic materials contain easily reducable nitro-groups in their structure enabling the application of electrochemical (voltammetric) methods. Generally trinitro- compounds (TNT or picric acid) are more readily reducable than the corresponding dinitro and mononitro analogues [1]. The shelf-life of TNT-based ammunition is very important for various military-purpose applications in Turkey, and therefore, such reliable and reproducible methods are important to observe the changes of TNT composition (i.e. TNT may lose one or more nitro groups which are vulnerable to amine conversion during possible bacterial degradation) during preservation.

In this study, a novel cyclic voltammetric (CV) method of determination has been developed for the most widely used military nitroaromatic explosive, trinitrotoluene (TNT). In this method, glassy carbon electrode was chosen as the working electrode, Ag wire as reference, Pt wire as opposite electrode, and tetrabutylammonium bromide (TBAB) as support electrolyte. CV responses were linear within 40-120 mg/L TNT concentration range. Since current intensity (I) is highest at -1 V potential, the calibration graph of current intensity versus concentration was constructed at this voltage, yielding the linear equation: I (mA) = 0.27 c (mg/L)+ 6.096 (r=0.9954). The developed method was applied to TNT determination in a military composite explosive Octol containing 70% HMX + 30% TNT.

Reference