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REVIEW

Flow injection analysis of some oxidants using spectrophotometric detection

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Abstract A spectrophotometric flow-injection method has been devised for the determination of nanomole quantities of some oxidants i.e. iodate, periodate, permanganate and hydrogen peroxide. The method is based on the oxidation of iron(II) to iron(III) and the measurement of the absorbance of the red iron(III)–thiocyanate complex at 485 nm. The optimal oxidation pH and the linearity ranges of the calibration curves have been investigated. The analytical aspects of the method including the statistical evaluation of the results are discussed. The analysis of some authentic samples showed an average percentage recovery of 99%.

Contents

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1. Introduction

Numerous conventional methods for the determination of iodate, periodate, permanganate and hydrogen peroxide have been reported (Abdul Hug and Rao, 1984; Al-Zamil, 1984; Rahim and Bashir, 1984; Garrido et al., 1986). Iodate and periodate were spectrophotometrically determined by methods based on the oxidation of iron(II) in the presence of dipyridylglyoxal dithisemicarbazone as a spectrophotometric reagent (Garrido et al., 1986) or $Fe(CN)_6^{4-}$ to form prussian blue (Rahim and Bashir, 1984). AL-Zamil consecutively determined periodate and iodate by indirect titration with EDTA at different acidic media (Al-Zamil, 1984). Permanganate, iodate and periodate have been determined by their oxidation of iron(II) and the formation of iron(III)–resacetophenone oxime red complex (Abdul Hug and Rao, 1984). However, the published flow-injection methods for the determinations of iodate (Chen et al., 1991; Oguma et al., 1993; Yagoob et al., 1991; Xie and Jingchan, 2004), periodate (Berzas-Nevado and Valiente-Gonzalez, 1989; Evmiridis, 1989) and permanganate (Al muai-

Table 1 The oxidation of 0.1 M iron(II) by various oxidants (4×10^{-5} M each) in different sulfuric acid media.

Oxidant 4×10^{-5} M	Absorbance of iron(III)–thiocyanate complex (mv)	
	in 0.01 M H_2SO_4	in 2 M H_2SO_4
$Cr_2O_7^{2-}$	181	261
MnO_4^-	183	194
NO_3^-	No response	–
NO_3^- [a]	–	555
NO_2^-	20	242
IO_4^-	59	242
IO_3^-	10	180
I^-	No response	No response
H_2O_2	80	90

[a] 4×10^{-4} M NO_3^-

Table 2 The oxidation of 0.1 M iron(II), prepared in different concentrations of hydrochloric acid, by either iodate or periodate (4×10^{-5} M each).

HCl (pH)	Absorbance of iron(III)–thiocyanate complex (mv)	
	IO_3^-	IO_4^-
4.00	No response	40
3.50	No response	70
2.50	No response	95
1.95	75	140
1.50	184	285
1.00	190	279

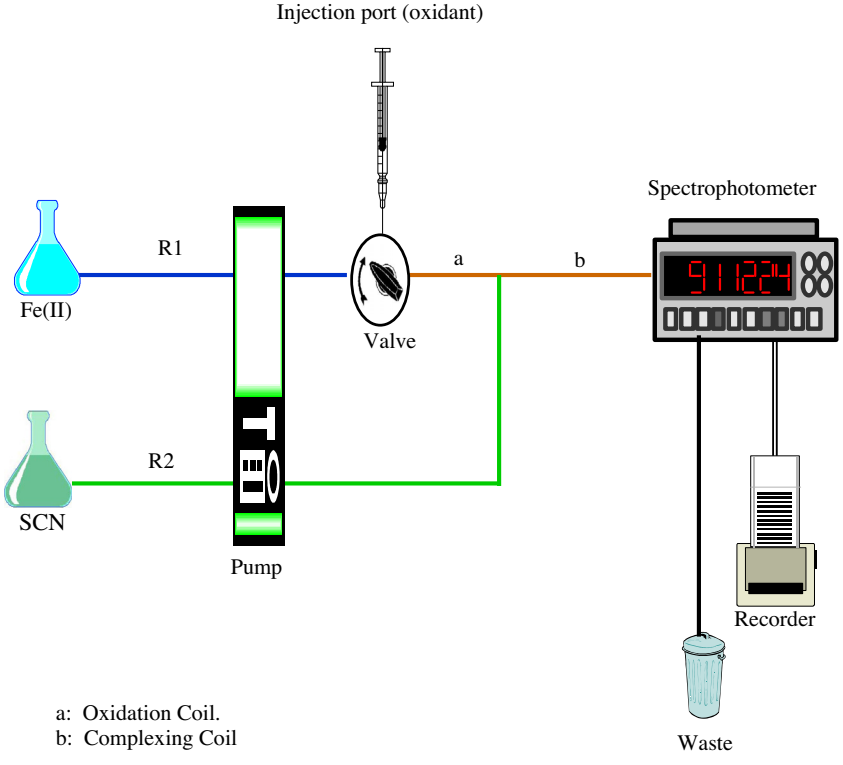

Figure 1 A schematic diagram of the manifold used for the presented work.