

SPECTROPHOTOMETRIC DETERMINATION OF BROMIDE IN COOLING WATER OF ELECTRIC POWER STATIONS

YU.I. TOKARENKO, O.V. ZUY

References:

1. Pacey, N.; Beadle, I.; Heaton, A.; Newsome, L. Chemical discharges from nuclear power stations: historical releases and implications for best available techniques. Report – SC 090012/R1. Environment Agency: Bristol, UK, 2011, 126 p.
2. Bartholomew, R.D. Bromine-based biocides for cooling water systems: a literature review. 59th International Water Conference, November 1998. IWC: Pittsburgh, PA, USA, 1998, Paper No.74, 523–553.
3. Quarles, C.D., Jr.; Toms, A.D.; Smith, R., Jr.; et al. Automated ICP-MS method to measure bromine, chlorine, and iodine species and total metals content in drinking water. *Talanta Open*. 2020, 1(5), 100002. <https://doi.org/10.1016/j.talo.2020.100002>
4. Xu, L.; Luo, C.; Ling, H.; et al. Determination of low bromine (Br) and iodine (I) in water with low- to high-salinity content using ICP-MS. *Int. J. Mass Spectrom.* 2018, 432, 52–58. <https://doi.org/10.1016/j.ijms.2018.07.009>
5. Daraei, H.; Maleki, A.; Mahvi, A.H.; et al. Simultaneous determination of inorganic anions in bottled drinking water by the ion chromatography method. *J. Water Chem. Technol.* 2015, 37, 253–257. <https://doi.org/10.3103/S1063455X15050082>
6. Potentiometric determination of bromide in aqueous samples with ion-selective electrode, Method 9211. US EPA: Washington, DC, 1996, 8 p.
7. Pilipenko, A.T.; Terletskaia, A.V.; Zui, O.V. Determination of iodide and bromide by chemiluminescence methods coupled with dynamic gas extraction. *Fresenius' Z. Anal. Chem.* 1989, 335, 45–48. <https://doi.org/10.1007/BF00482390>
8. Baird, R.B.; Eaton, A.D.; Rice, E.W. Standard Methods for the Examination of Water and Wastewater, 23rd edition. APHA, AWWA, WEF: Washington, DC, 2017; 4-30–4-31.
9. Kirsten, W. J.; Lindholm-Franzén, I. Spectrophotometric determination of chloride, bromide, and iodide with an improved mercury-iron-thiocyanate method. *Microchem. J.* 1980, 25, 240–245. [https://doi.org/10.1016/0026-265X\(80\)90136-8](https://doi.org/10.1016/0026-265X(80)90136-8)
10. Ma, Y.; Shen, X.-F.; Liu, F.; Pang, Y.-H. Colorimetric detection toward halide ions by a silver nano-cluster hydrogel. *Talanta*. 2020, 211, 120717. <https://doi.org/10.1016/j.talanta.2020.120717>
11. Utsumi, S.; Kotaka, M.; Isozaki, A. Spectrophotometric determination of the micro amounts of iodide and bromide by the formation of triiodide ion. *Bunseki Kagaku*. 1985, 34, 81–86. https://doi.org/10.2116/bunsekikagaku.34.2_81
12. Lepore, B.J.; Barak, P. A colorimetric microwell method for determining bromide concentrations. *Soil Sci. Soc. Am. J.* 2009, 73, 1130–1136. <https://doi.org/10.2136/sssaj2007.0226>
13. Mesquita, A.Z.; Reis, I.C.; de Almeida, V.F.; et al. Boron-10 effect on the reactivity of the IPR-R1 triga research reactor. *Ann. Nucl. Energy*. 2019, 132, 64–69. <https://doi.org/10.1016/j.anucene.2019.04.023>
14. Azevedo, M.C.C.; Cavaleiro, A.M.V. The acid-base titration of a very weak acid: boric acid. *J. Chem. Educ.* 2012, 89, 767–770. <https://doi.org/10.1021/ed200180j>
15. Adimurthy, S.; Susarla, V.R.K.S.; Reddy, M.P.; Ramachandraiah, G. Spectrophotometric estimation of bromide ion in excess chloride media. *Talanta*. 2005, 67, 891–896. <https://doi.org/10.1016/j.talanta.2005.03.033>
16. Guo, Y.; Liu, C.; Ye, R.; Duan, Q. Advances on water quality detection by UV-Vis spectroscopy. *Appl. Sci.* 2020, 10, 6874. <https://doi.org/10.3390/app10196874>
17. Jung, S.-H.; Yeon, J.-W.; Kang, Y.; Song, K. Determination of Triiodide Ion Concentration Using UV-Visible Spectrophotometry. *Asian J. Chem.* 2014, 26, 4084–4086. <https://doi.org/10.14233/ajchem.2014.17720>
18. Marim, R.G.; Galvan, D.; Borges, D.L.G.; Chaves, E.S. A novel alkaline extraction method for determination of Br and I in oil and gas industry wastes using inductively coupled plasma mass spectrometry. *Microchem. J.* 2025, 214, 114077. <https://doi.org/10.1016/j.microc.2025.114077>
19. Florence, T.M.; Farrar, Y.J. Spectrophotometric determination of chloride at the parts-per-billion level by the mercury(II) thiocyanate method. *Anal. Chim. Acta.* 1971, 54, 373–377. [https://doi.org/10.1016/S0003-2670\(01\)82142-5](https://doi.org/10.1016/S0003-2670(01)82142-5)
20. Fishman, M.J.; Friedman, L.C. (Eds). Methods for determination of inorganic substances in water and fluvial sediments, USGS—TWRI Book 5, Chapter A1, USGS, 1989, 233–234.