

Elemental Analysis of Biological Samples by ICP OES After Combustion in an Oxygen Bomb

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Combustion with oxygen in a sealed bomb has been used to convert solid and liquid combustible samples into soluble forms for chemical analysis [1-2]. In this system, the organic matter is oxidized to carbon dioxide and water during combustion and the volatile components formed by burning are trapped in an absorption solution. An oxygen combustion bomb-ion chromatography method was applied for elemental analysis in organic compounds, fuel and hazardous wastes with indirect photometric detection [3-4]. In the present work, a rapid sample preparation method is proposed for decomposition of milk powder, bovine tissues, and plant materials containing certified contents of the analytes. The combustion was carried out in a commercial Parr™ stainless steel oxygen bomb (300 mL) at an oxygen pressure of 25 atm. The bomb was fired via an electrical discharge through a platinum wire, which was placed in a stainless steel capsule containing the sample (500 mg). Most of the samples were decomposed within 5 min, including a cooling step. A water-soluble tertiary amine 10% v/v solution (CFA-C) was used as absorption medium and the inorganic elements Ca, K, Mg, Na, P, S, and Zn were recovered with the bomb washings and determined in a simultaneous inductively coupled plasma optical emission spectrometer (ICP OES, Vista, Varian) with radial view configuration. The ICP OES was operated with a concentric nebulizer coupled to a cyclone type nebulization chamber. Most of the elements recoveries in the samples were between 95 and 100% and the certified and found contents exhibited a fair agreement at a 95% confidence level. The procedure was extended for determining iodine in milk samples spiked with potassium iodide prior combustion. The goal was to evaluate the volatilization and collection of iodine in CFA-C medium and its determination by ICP OES with axial view configuration (I 182.978 nm). All recoveries were around 95-105% and the instrumental detection limit was 1.5 mg L⁻¹. The combustion procedure is rapidly applied and for an element as iodine any losses caused by volatilization in open systems and any undesirable effect caused by acid medium are avoided.

References

1. C. A. Gent and S. A. Wilson, *Anal. Letters*, 18:729, 1985.
2. J. E. Hicks, J. E. Fleenor and H. R. Smith, *Anal. Chim. Acta*, 68:480, 1974.
3. Y. S. Fung and K. L. Dao, *Anal. Chim. Acta*, 315:347, 1995.
4. Y. S. Fung and K. L. Dao, *Anal. Chim. Acta*, 334:51, 1996.