DETERMINATION OF VANADIUM IN ASPHALTITE USING ATOMIC SPECTROMETRY

İşıl AYDIN, Ersin KILINC, Firat AYDIN, Candan HAMAMCI

Department of Chemistry, Faculty of Science and Art, Dicle University, TR 21280 Diyarbakır, Turkey
(candanham@dicle.edu.tr) and fax: 0412 24 88 389

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Asphaltites, originating from petroleum, are solid fossil fuels. Some valuable elements may be recovered from their ashes [1, 2]. Vanadium (V) is recognized worldwide as the most abundant metallic constituent in petroleum. So, it is the most widely determined metal in petroleum and its derivatives. Knowledge of the molecular environment associated with both vanadium and nickel in heavy crude oils and asphaltites is also required to provide an improved understanding of the biogeochemical mechanisms responsible for the inclusion of these metals during the diagenesis and maturation process of petroleum formation. There is a need for the quantification of V in crude oil and its derivatives since it is a serious catalyst poison, and may cause undesirable side reactions in refinery operations. Two atomic spectrometric techniques have been used for the determination of V in SE Anatolia asphaltite and its bottom ash, among which are atomic absorption spectrometry (AAS) with flame and inductively coupled plasma atomic emission spectrometry (ICP-AES). The sample pretreatment and preparation procedures for vanadium determination in asphaltite and asphaltite based bottom ash were investigated. It is necessary to use an appropriate sample preparation in order to avoid measurement errors. The selected sample preparation procedure involves the task to obtain the best results in the shortest time, with minimum contamination, using the smallest quantities of reagents and samples, and having little residue and waste generation. In addition it is of importance to maintain the integrity of the sample and the traceability of the results, to have quality and confidence in the measurements [3]. The sample preparation method used in this study for V determination in asphaltite by spectroanalytical technique is dry ashing, and wet acid microwave digestion. V determination by FAAS requires the use of a nitrous oxide–acetylene flame at 318.5 nm about 2mg L⁻¹ sensitivity. Compared to AAS, ICP-AES offers a wider linear dynamic range and has multielement detection capability, while AAS is basically a monoelement technique. The line at 292.402 nm about 0.01 mg L⁻¹ sensitivity was used, as it has the highest sensitivity and the greatest freedom from interference effects, using equipment with good resolution of ICP-AES. The method was validated through the analysis of an SRM with good recoveries.

References