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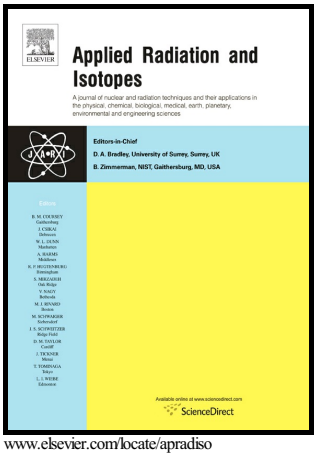

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Determination of impurities in graphite using synchrotron radiation based X-ray fluorescence spectrometry

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Abstract

Determination of impurities namely Ca, Mn, Fe, Ni, Zn, Sr and Pb in graphite by energy dispersive X-ray fluorescence spectrometry is described using microfocused synchrotron radiation. The internal standard and standard addition methodologies were adopted for quantification and the results were compared with tube-based X-ray fluorescence spectrometry. Analysis of the results by the F and t tests revealed their statistical equivalence. Synchrotron measurements improved the detection limits by an order of magnitude compared to the tube based technique. Cr and Zr, which were below the quantification limit in tube based technique, were also quantified by synchrotron based technique.

Key words: Graphite, Impurities, Synchrotron radiation, EDXRF, Internal standard method

1. Introduction

High purity graphite is used as a moderator as well as reflector in nuclear reactors (Obi, 1990; Kelly, 1982) and is a precursor for nuclear fuels in the fast breeder test reactor (Basak et.al., 2004). Knowledge of the trace elements content in graphite is essential for evaluating its suitability in such applications (Mahanti and Barnes, 1983; Natarajan et. al., 2010). Various analytical techniques including inductively coupled plasma optical emission spectrometry (Mahanti and Barnes, 1983; Koshino and Narukawa, 1993) and inductively coupled plasma mass spectrometry (Pickhardt , 2001) have been used for the determination of trace impurities