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YUNIBESITHI YA PRETORIA

ANALYSIS OF COBALT, TANTALUM, TITANIUM, VANADIUM AND CHROMIUM IN TUNGSTEN CARBIDE BY INDUCTIVELY COUPLED PLASMA-OPTICAL EMISSION SPECTROMETRY

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by

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SYNOPSIS

Inductively coupled plasma-optical emission spectroscopy was used to measure the concentrations of cobalt, tantalum, titanium, vanadium and chromium in solutions of tungsten carbide. The main advantage of the method described here lies in the speed, convenience and effectiveness of the dissolution procedure. Aliquots of powdered tungsten carbide are dissolved in 5% aqua regia in 30% hydrogen peroxide. Complete dissolution was usually achieved within 10 minutes. The accuracy and precision of this novel method was assessed by the analysis of certified reference materials, secondary reference materials and matrix spiking. The method was successfully applied to commercial type samples with differing compositions.

SAMEVATTING

Induktief gekoppelde plasma-optiese emissie spektrometrie is gebruik om die konsentrasie van kobalt, tantaal, titaan, vanadium en chroom in oplossings van wolframkarbied te bepaal. Die hoofvoordeel van die metode wat hier beskryf word, is die spoed, gemak en doeltreffendheid van die monster-voorbereiding. Verpoeierde wolframkarbied monsters het gewoonlik binne 10 minute opgelos na die byvoeging van 'n mengsel bestaande uit 5% aqua regia in 30% waterstofperoksied. Die akkuraatheid en presisie van hierdie nuwe metode is ondersoek deur gesertifiseerde verwysingsmateriale en sekondêre verwysingsmateriale te ontleed, asook deur matrysbyvoegings. Die metode is suksesvol toegepas op kommersieële monsters met verskillende samestellings.

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CONTENTS

CONTENTS

LIST OF TABLES

LIST OF FIGURES

Page

APPENDICES

LIST OF ABBREVIATIONS

AAS – Atomic absorption spectrometry

g/ 100 g – Grams per 100 grams

ICP – Inductively coupled plasma

ISO – International Organization for Standardization

LOD – Limit of detection

LOQ – Limit of quantification

mg/ ℓ – Milligrams per litre, sometimes expressed as parts per million (ppm)

nm – Nanometre (10^{-9} m)

OES – Optical emission spectrometry

r^2 – Coefficient of determination

RSD – Relative standard deviation

XRD – X-ray diffraction

XRF – X-ray fluorescence