



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

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SPECTROMETRY**

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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APPENDICES

Appendix 1: Properties of sintered carbides (Brookes, 1979)

Appendix 2: Tables of typical carbide grades for machining and tables of the historical developments of sintered carbides

Appendix 3: Certificate of analysis: standard reference material 889, cemented carbide

Appendix 4: Calibration data



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