



WM '03 23rd - 27th February 2003
Tucson, Arizona

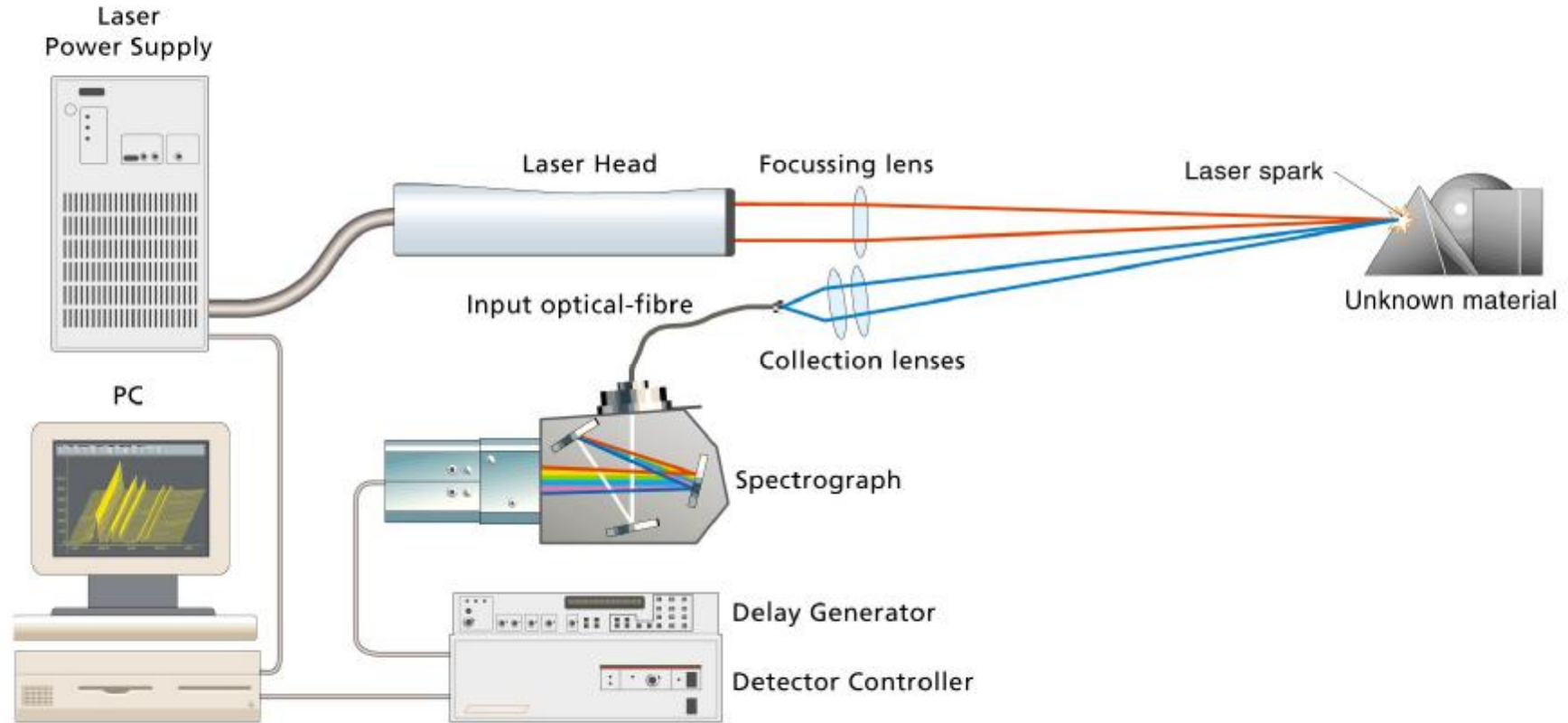


Remote compositional analysis of spent-fuel residues using Laser-Induced Breakdown Spectroscopy

Dr Andrew Whitehouse
Applied Photonics Ltd
Unit 8, Carleton Business Park
Skipton, North Yorkshire
BD23 2DE, UK

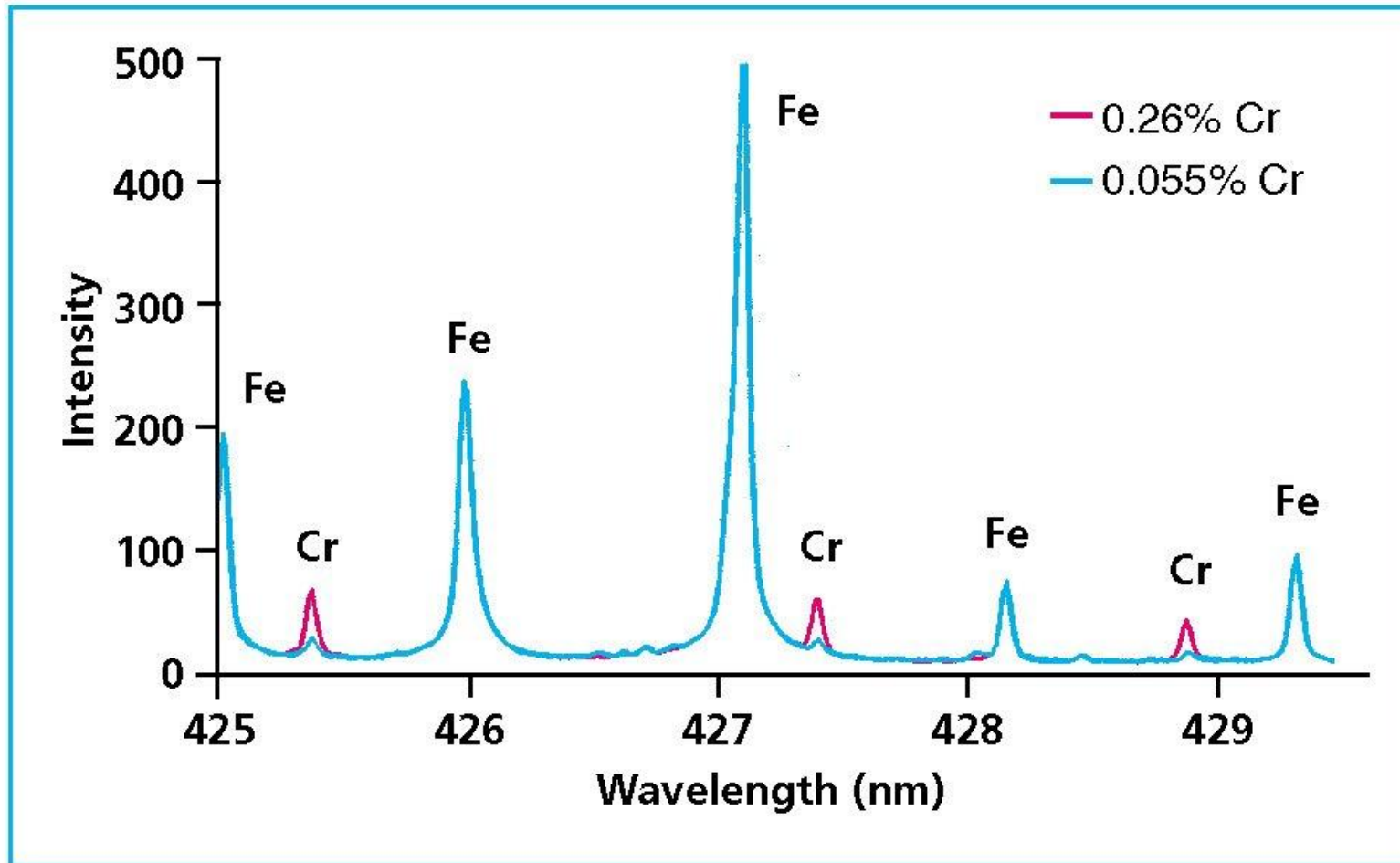
- Introduction to Laser-Induced Breakdown Spectroscopy (LIBS)
- Nuclear applications
 - Spent-fuel reprocessing
 - High-level waste vitrification
- Summary
- Acknowledgements

Laser Induced Breakdown Spectroscopy (LIBS)

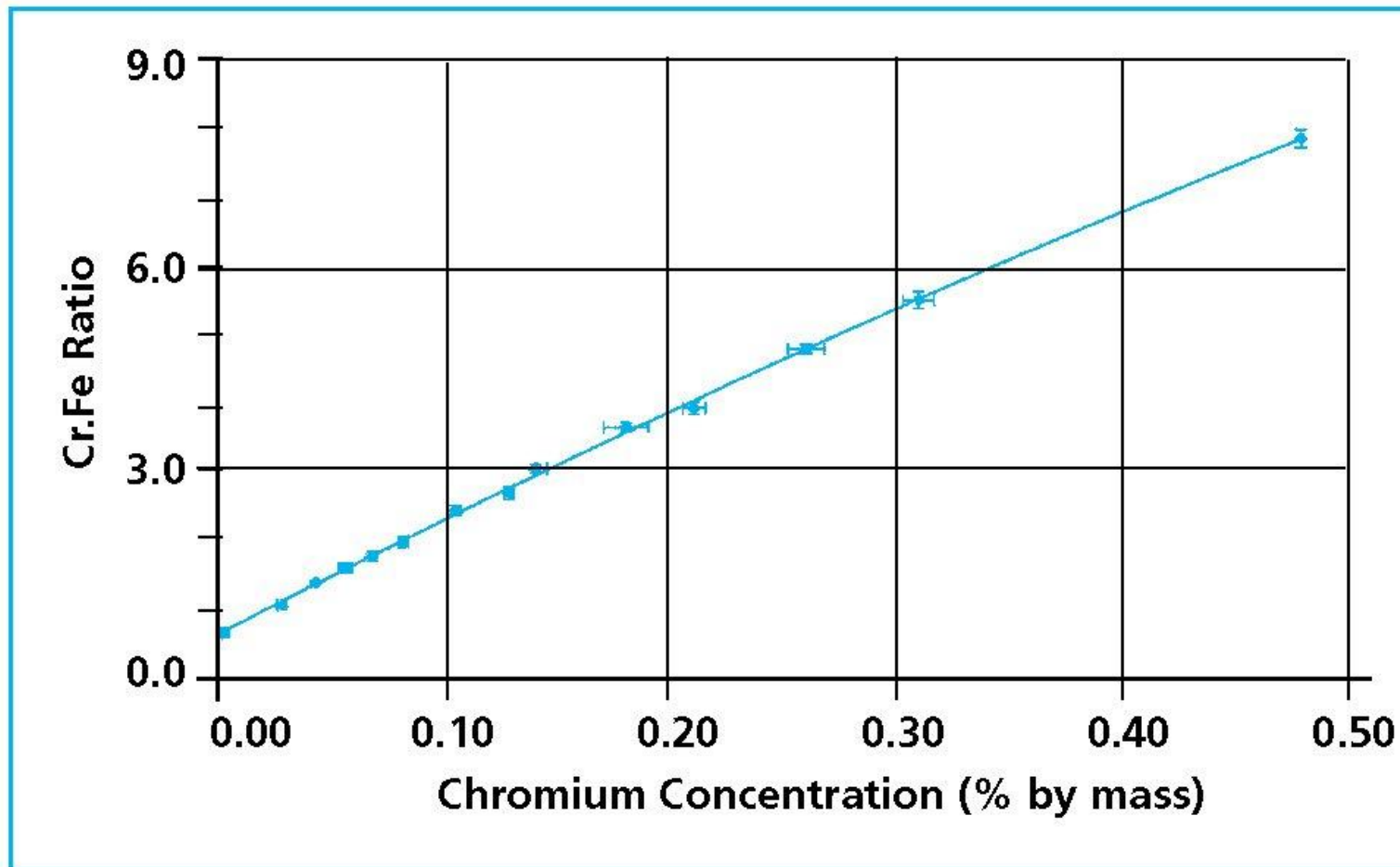


Laser generated spark on a steel sample



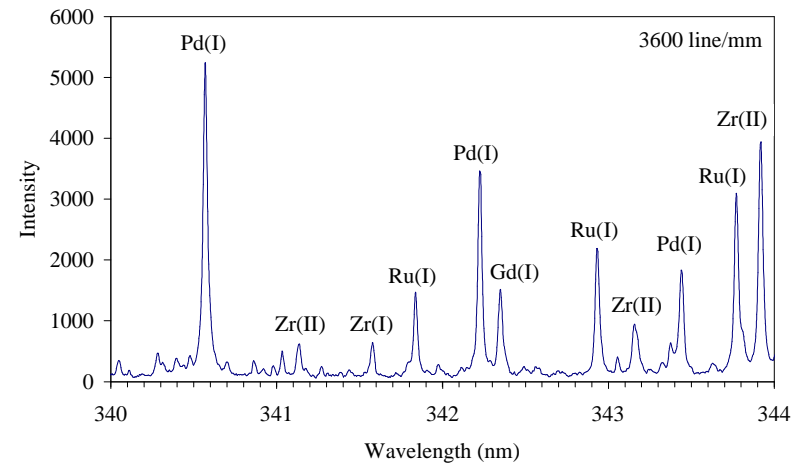
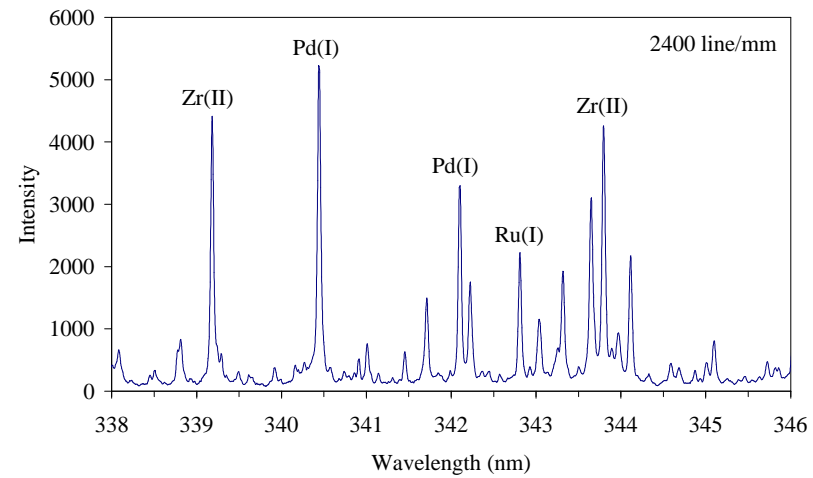
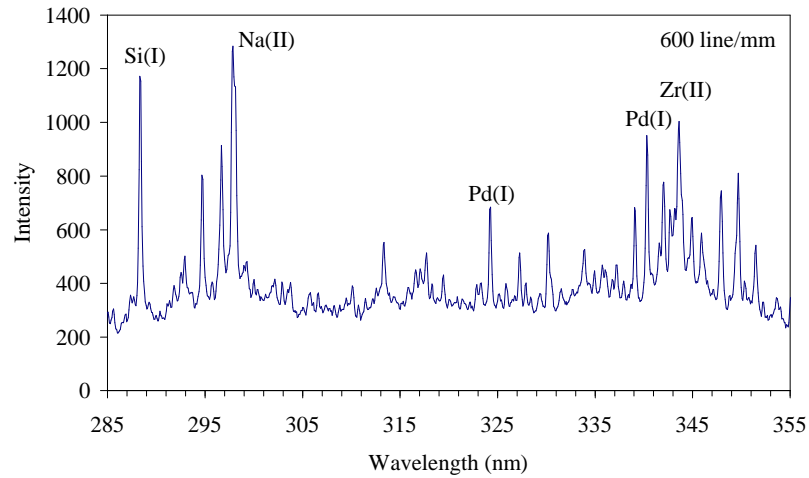


LIBS spectra obtained from steel showing Fe and Cr emission lines

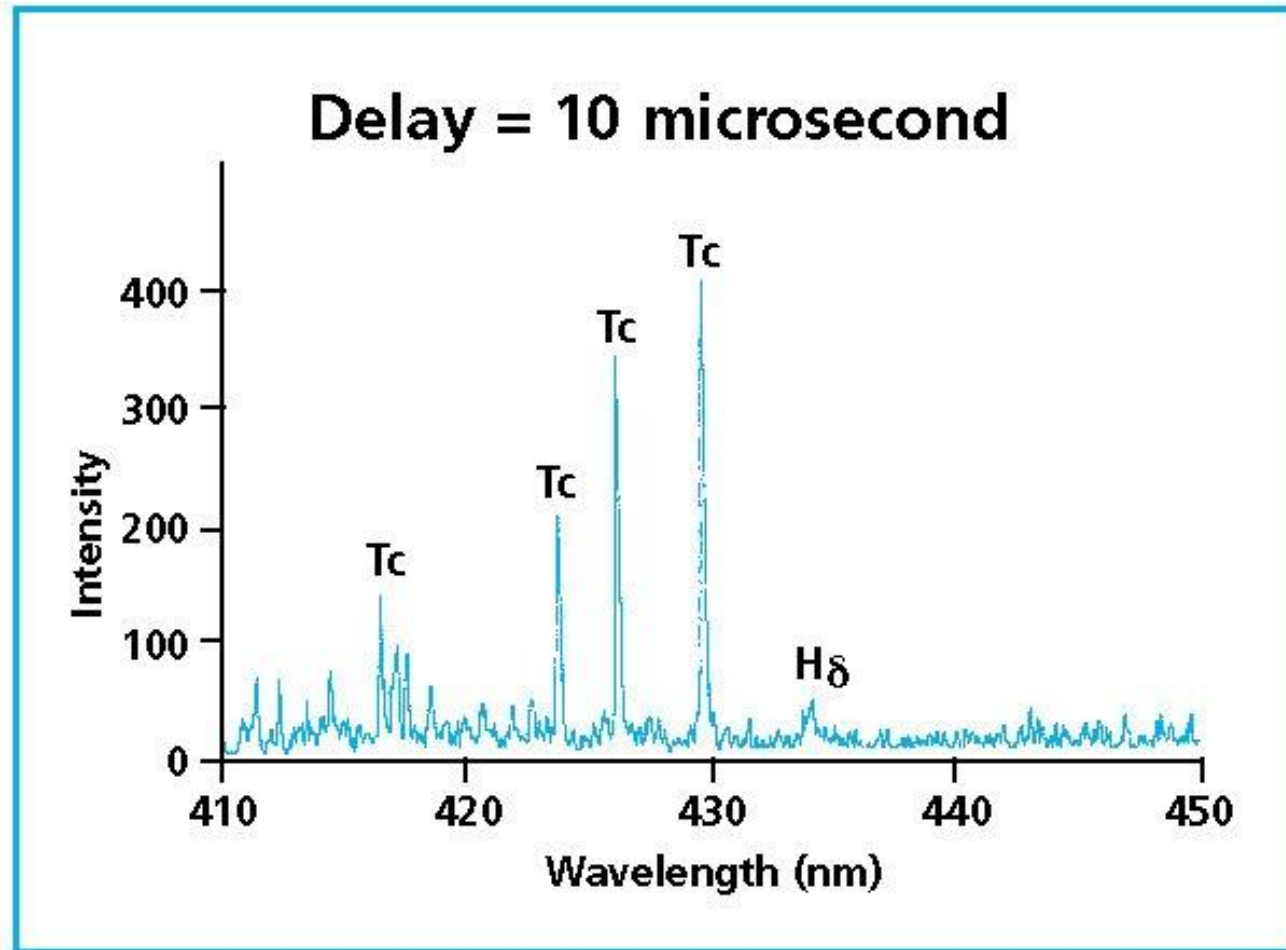


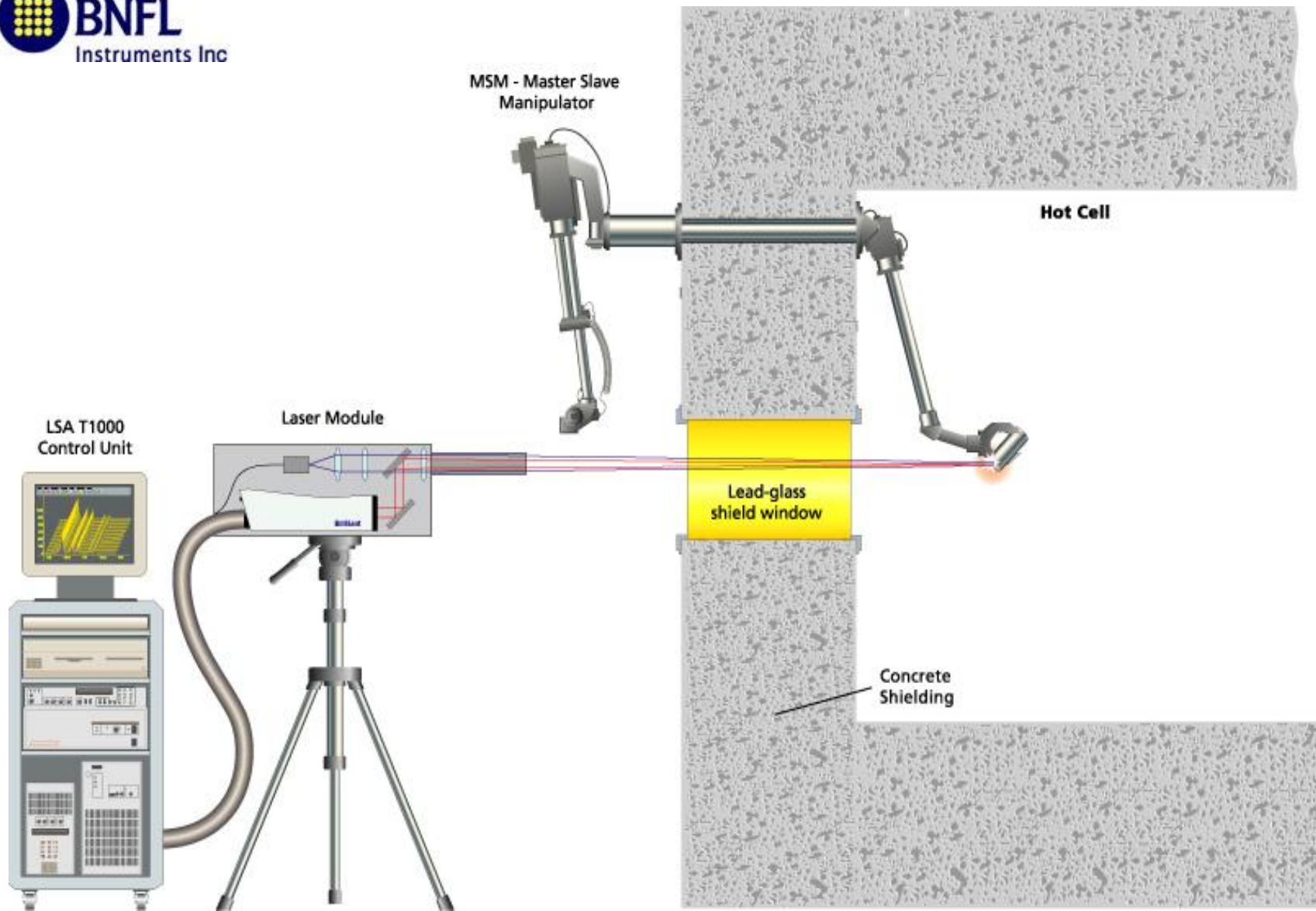
Chromium calibration curve using Internal Standardisation

LIBS spectra of Simulated Vitrified HLW



LIBS spectrum of Technetium solution





T1000 Laser Spark Analyser

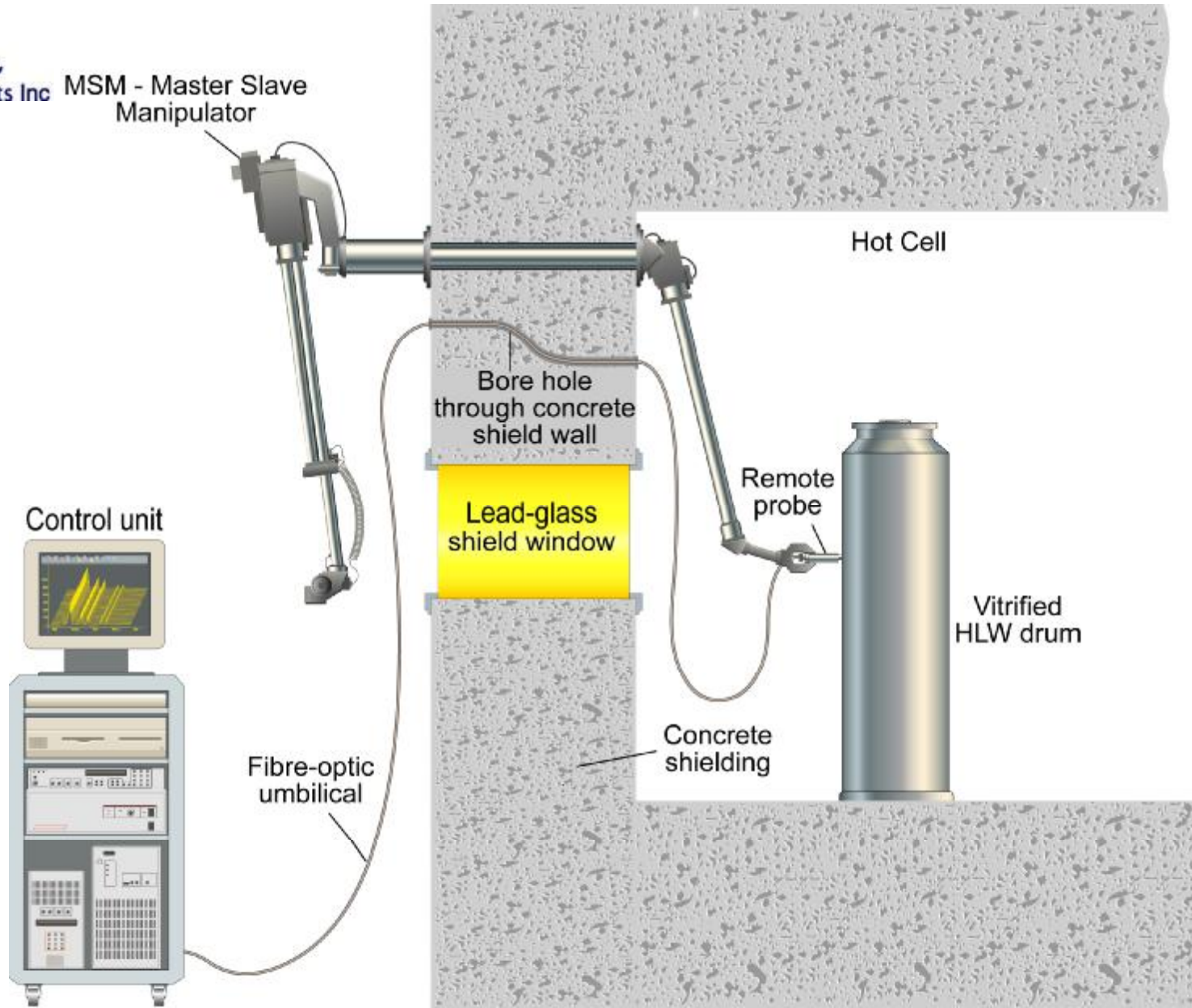




BNFL

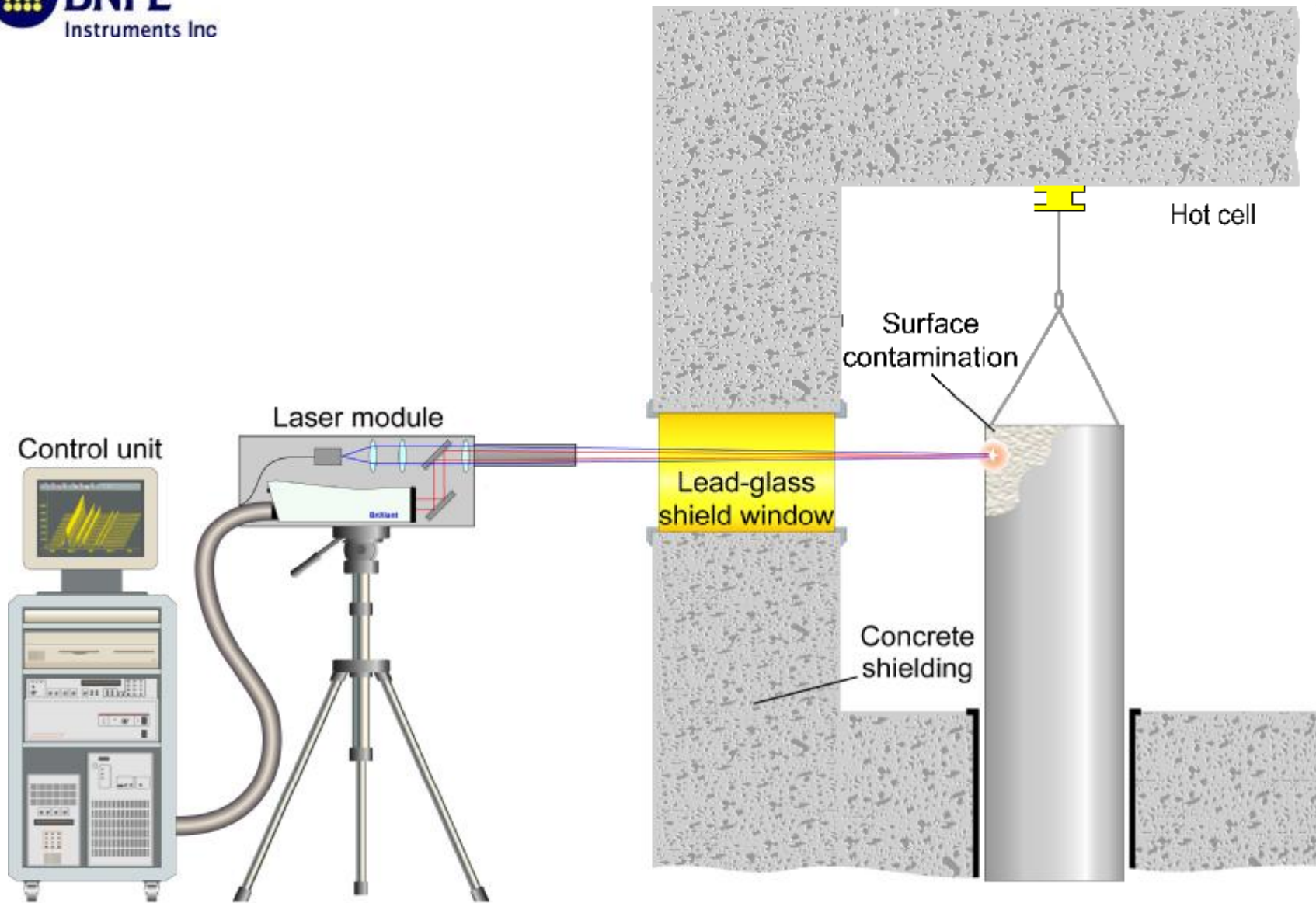
Instruments Inc

MSM - Master Slave Manipulator

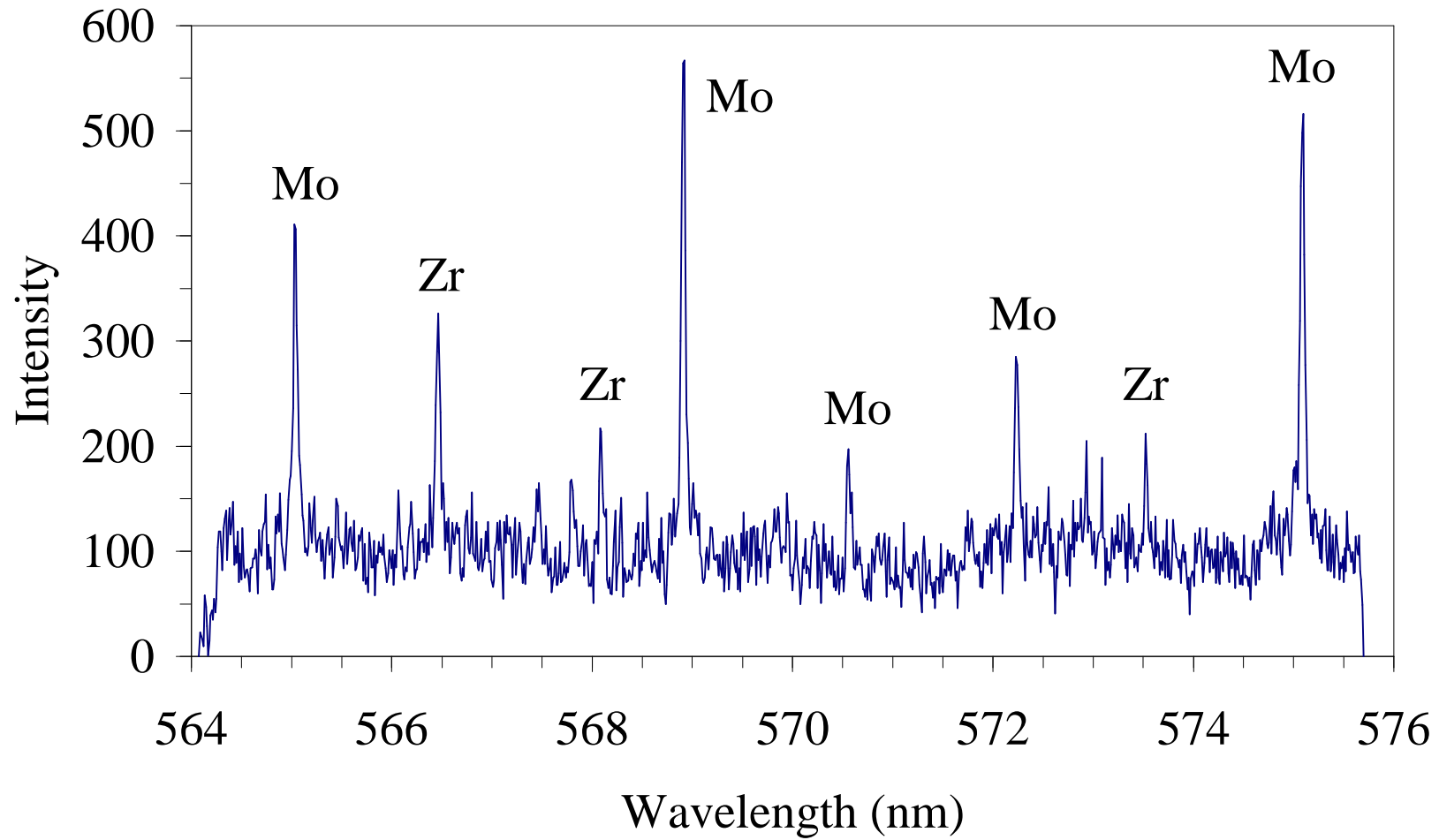


F1000 Laser Spark Analyser

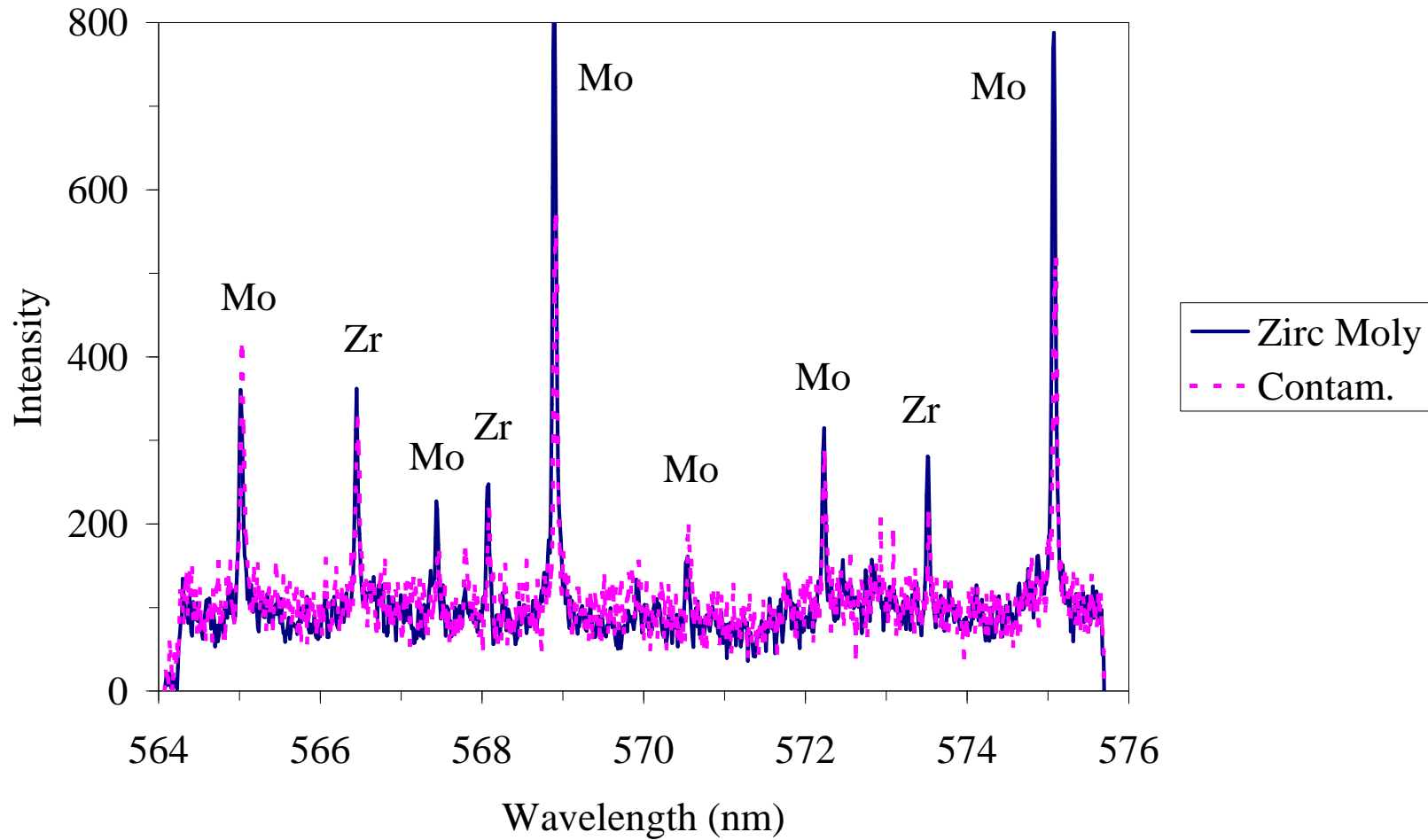




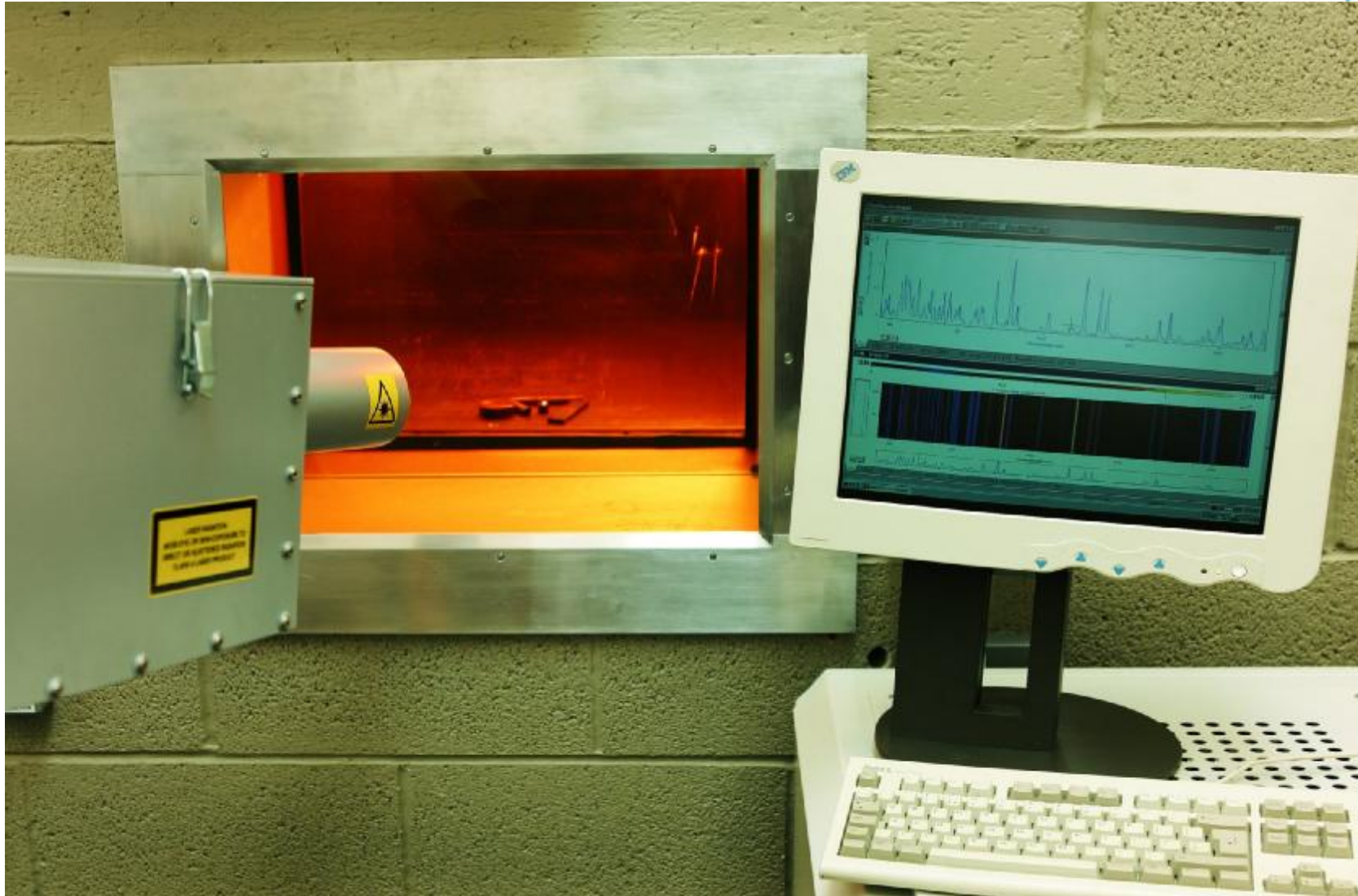
LIBS spectrum of contaminant material



Comparison of spectra obtained from contaminant material and inactive zirconium molybdate

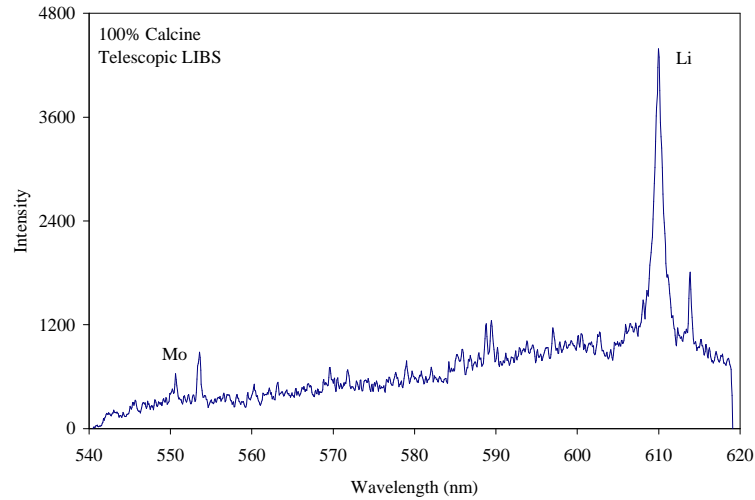
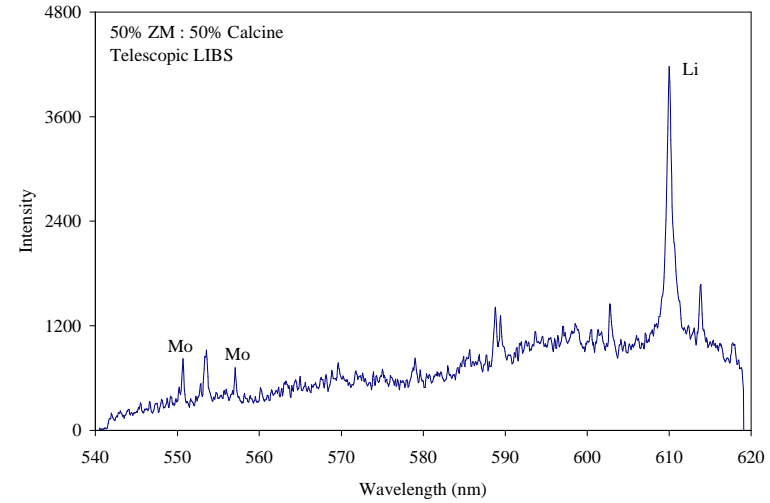
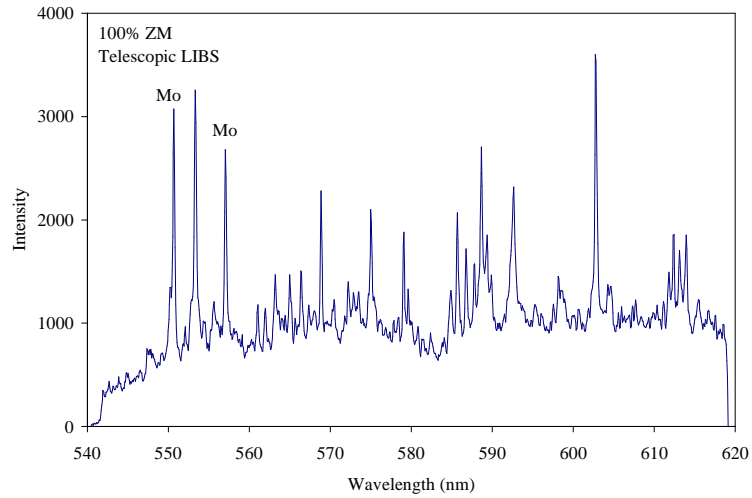


Calibration tests using mock-up Hot-Cell

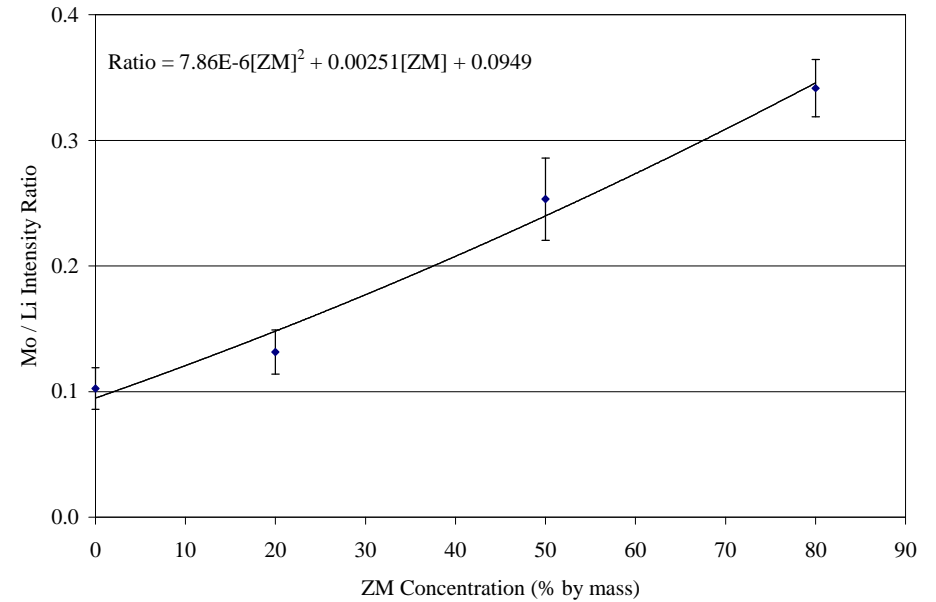
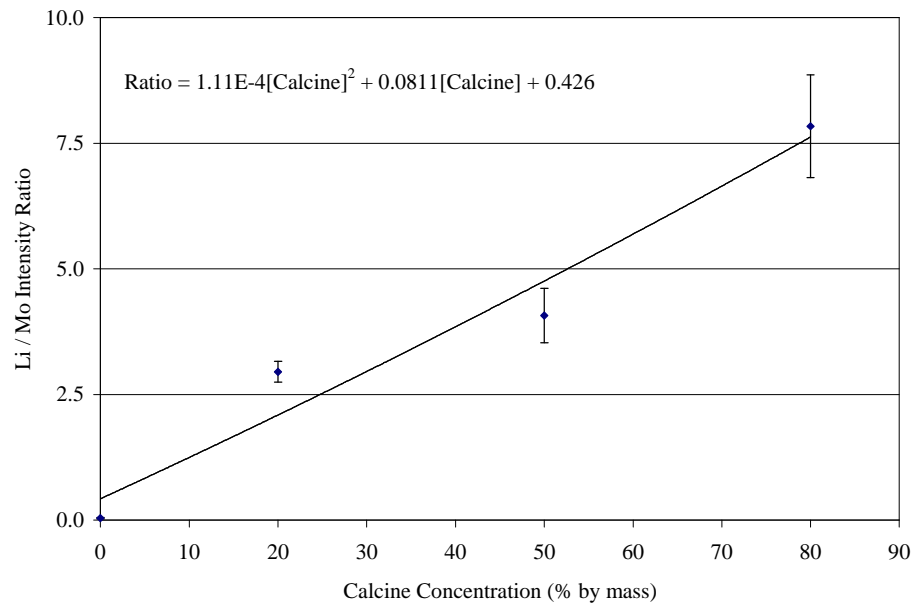




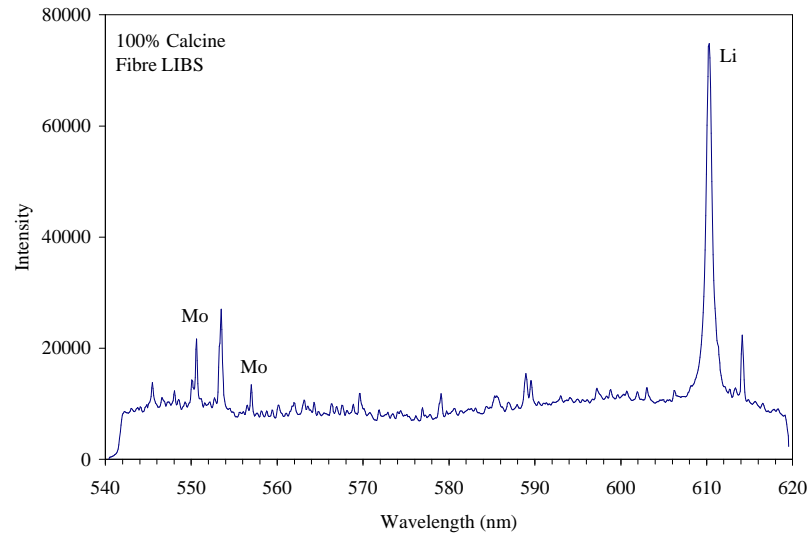
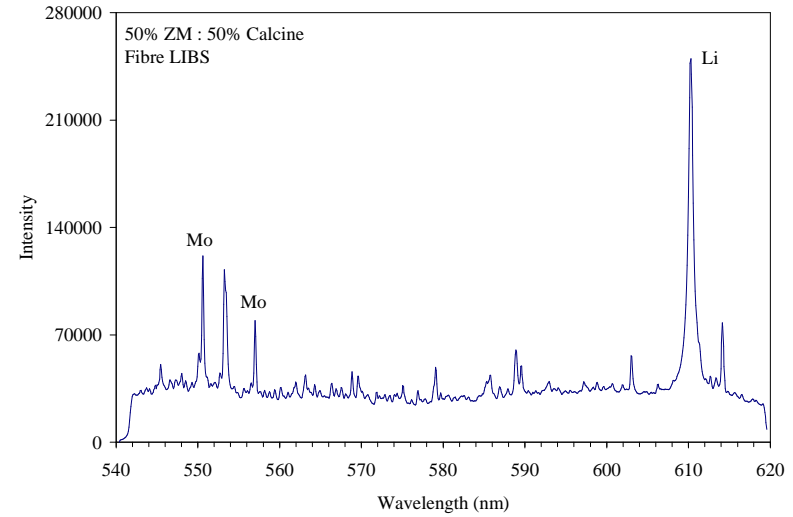
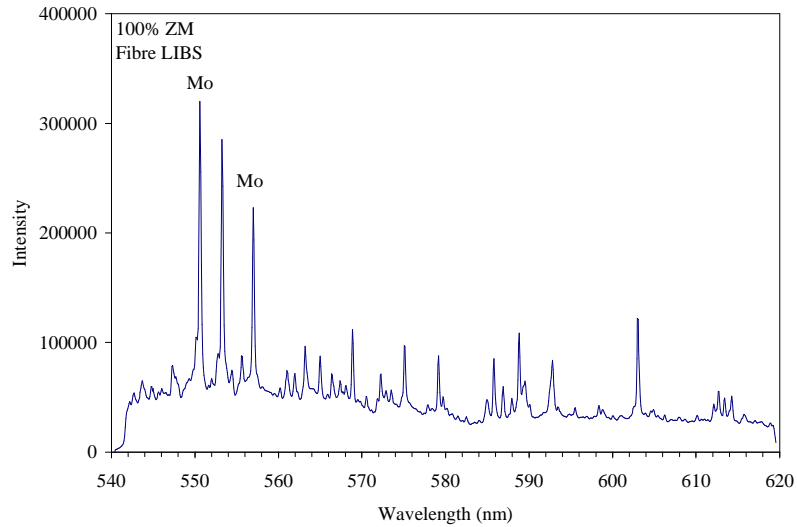
Spectra obtained using the Telescope LIBS instrument



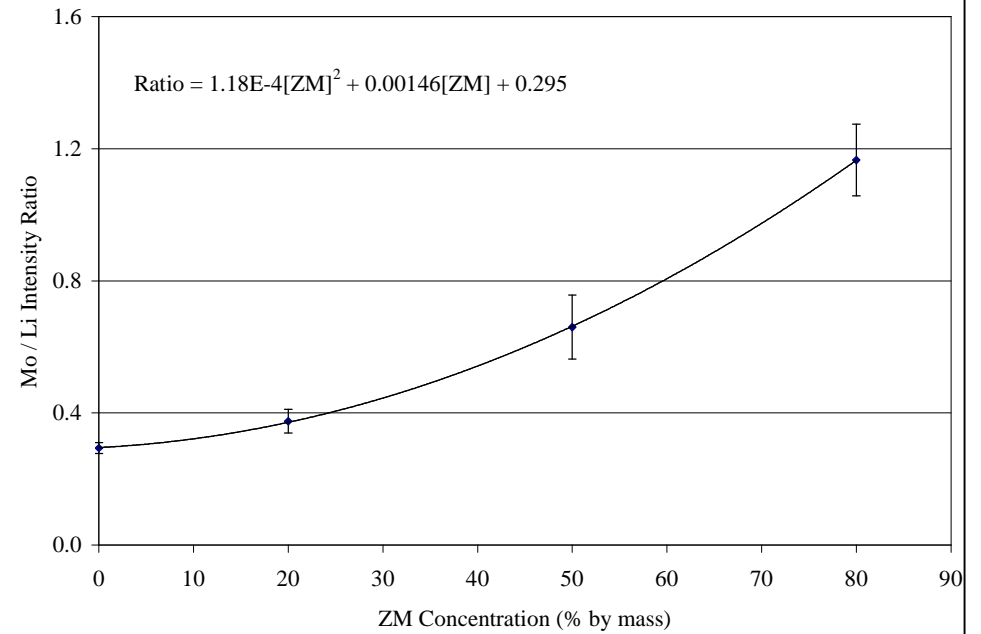
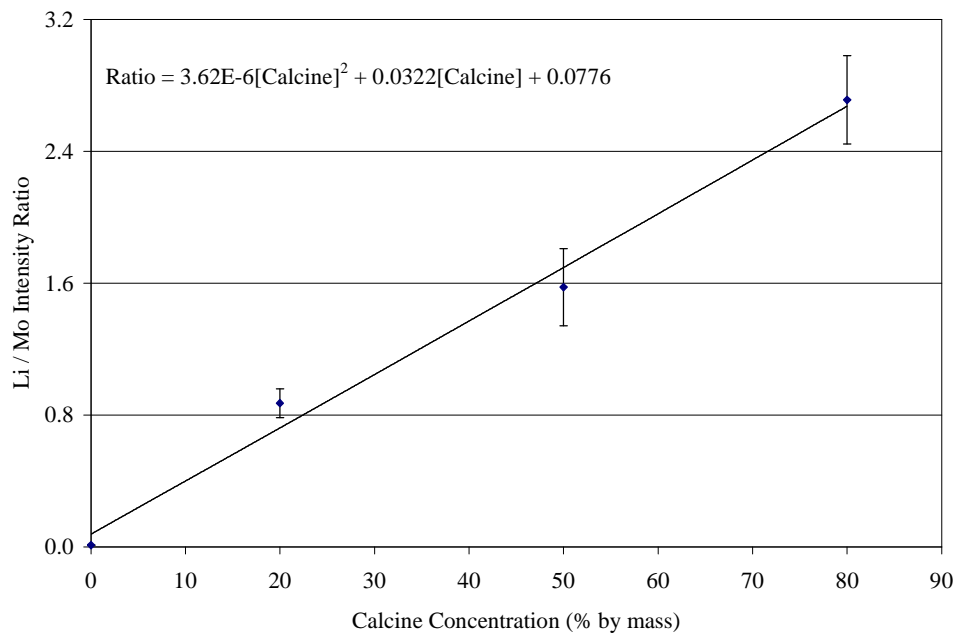
Calibration curves obtained using the Telescope LIBS instrument



Spectra obtained using the fibre-optic probe LIBS instrument



Calibration curves obtained using the fibre-optic probe LIBS instrument



- LIBS is able to remotely characterise the elemental composition of virtually any material (solids, liquids and gases)
- Non-invasive or remote probe deployment
- Essentially non-destructive
- No sample preparation necessary
- Can be deployed in very high radiation areas
- Rapid measurements
- Qualitative, semi-quantitative and quantitative measurements