



HI·Lab
Hard materials Innovation lab
OMCD GROUP

ANALYSIS 
CAPABILITIES

POWDER CHARACTERIZATION

PROPERTY	METHOD	INSTRUMENT	REF.
Powder grain size	Fisher Sub-Sieve Size	Particulate System Sub Sieve Autosizer	ASTM B330
Powder gain size distribution	Laser diffraction	Malvern Mastersizer 2000	ASTM E2651
Apparent Density	Scott density	Scott Volumeter	ASTM B329
Flowability	Flow	Flow rate apparatus	ASTM B213
Carbon content	Infra-Red Spectroscopy	LECO WC230 IR Spectrometer	ISO 11873
Oxygen content	Infra-Red Spectroscopy	LECO RO400 IR Spectrometer	-
Morphology	Optical Microscopy up to 2000x	Leitz Aristomet	ISO 4499
Morphology	Optical Microscopy up to 2000x	Leica DMI8A	ISO 4499
Morphology	Scanning Electron Microscopy	Jeol JSM IT700HR Jeol JSM 5500LV	ISO4499
Composition	Energy Dispersion Spectroscopy	Bruker X-Flash 6I30 iXRF System EDS	ISO 22309
Composition	Wave Dispersion Spectroscopy	Bruker XSense	-
Composition	Tritation	Mettler Toledo T5	ISO 3909
Trace elements analysis	ICP-OES	ThermoScientific Icap PRO	(ISO4883)

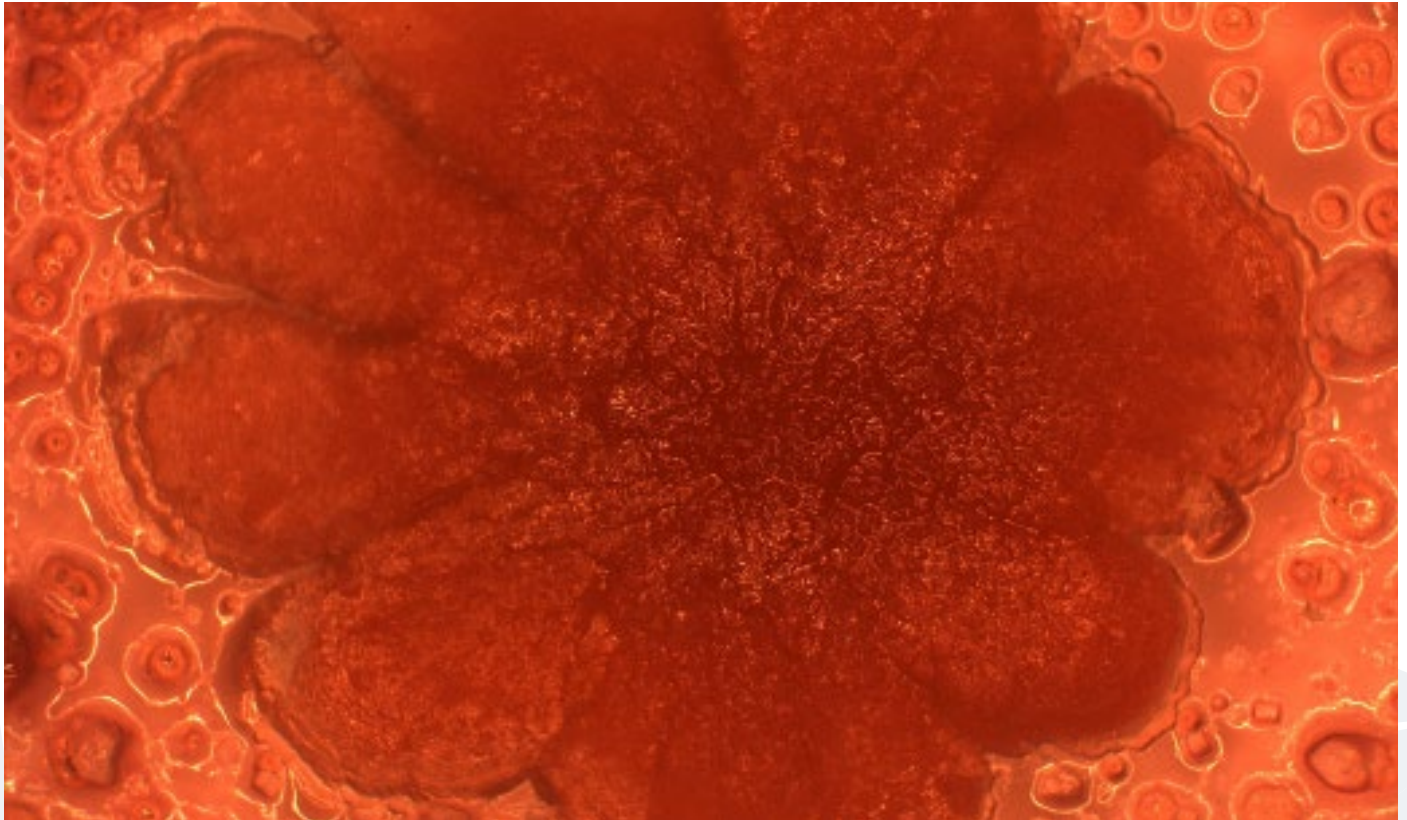
MATERIAL PHYSICAL-METALLURGICAL AND METALLURGICAL QUALITY CHARACTERIZATION

PROPERTY	METHOD	INSTRUMENT	REF.
Density	Buoyancy technique	Mettler AM100 balance	ISO 3369, ASTM B 311
Hardness	Rockwell A	Wolpert Instron 600	ISO 3738, ASTM B 294
Hardness	Vickers	Wiki 200 JS	ISO 3878
Hardness	Rockwell C	CISAM Ernst	ISO 6508
Hardness	Brinell	Proceq Equotip portable tester	Proceq procedure
Magnetic Moment	Magnetometry	Förster Koerzimat 1.096	ISO 3326, ASTM B886
Coercive Force	Magnetometry	Förster Koerzimat 1.096	ASTM B887
Grain size	Optical Microscopy + Image Analysis	Leica Dmi8A + ImageJ	ISO 4499
Carbon content	Infra-Red Spectroscopy	LECO WC230 IR Spectrometer	ISO 11873
Oxygen content	Infra-Red Spectroscopy	LECO RO400 IR Spectrometer	-
Composition	Energy Dispersion Spectroscopy	Bruker X-Flash 6I30 iXRF System EDS	ISO 22309
Composition	Wave Dispersion Spectroscopy	Bruker XSense	-
Composition	Tritation	Mettler Toledo T5	ISO 3909
Trace elements analysis	ICP-OES	ThermoScientific Icap PRO	(ISO4883)
Microstructure	Optical Microscopy up to 2000x	Leitz Aristomet	ISO 4499
Microstructure	Optical Microscopy up to 2000x	Leica Dmi8A	ISO 4499
Microstructure	Optical Microscopy up to 32x	Makroskop Wild M420	Internal procedure
Microstructure	Scanning Electron Microscopy	Jeol JSM IT700HR Jeol JSM 5500LV	ISO4499
Mechanical Strength	Transverse Rupture Strength	Galdabini Quasar 50	ISO 3327, ASTM B 406

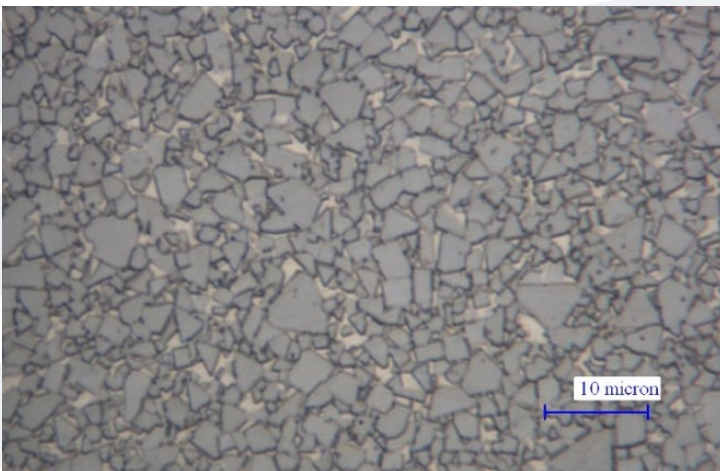


MATERIAL PROPERTIES CHARACTERIZATION

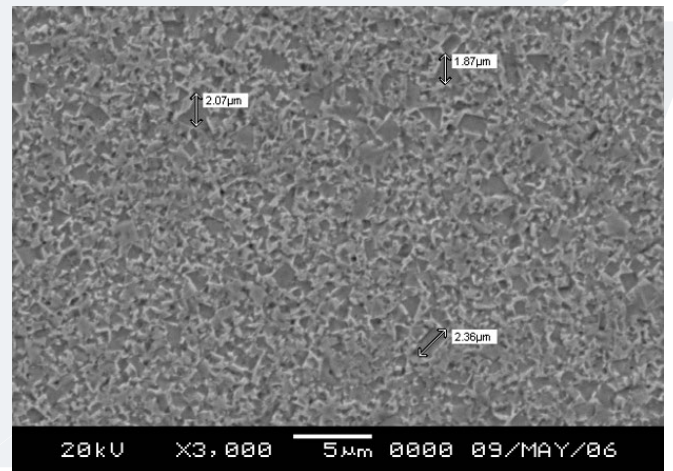
PROPERTY	METHOD	INSTRUMENT	REF.
Powder mix production	Lab scale powder mixing	ball mills and attritors	Internal procedure
Alloying	Mechanical alloying	Retsch PM400 high energy ball mill	Internal procedure
Hardness	Rockwell A	Wolpert Instron 600	ISO 3738, ASTM B 294
Hardness	Vickers	Wiki 200 JS	ISO 3878
Hardness	Rockwell C	CISAM Ernst	ISO 6508
Hardness	Brinell	Equotip	Proceq procedure
Mechanical Strength	Transverse Rupture Strength	Galdabini Quasar 50	ISO 3327, ASTM B 406
Toughness	Palmqvist Toughness	Wiki 200 JS	ISO 28079
Impact resistance	Impact test	Impact apparatus	Internal procedure
Abrasion resistance	Abrasion test	Abrasion apparatus	ASTM B 611
Corrosion resistance	Immersion test	Corrosion apparatus	ASTM G31
Corrosion resistance	Water fog test	Water fog apparatus	ASTM D 1735
Corrosion resistance	Electrochemical testing	AMEL 750 potentiostat-galvanostat	Internal procedure
Tribo-corrosion behaviour	Tribocorr testing	Tribocorr apparatus	Internal procedure



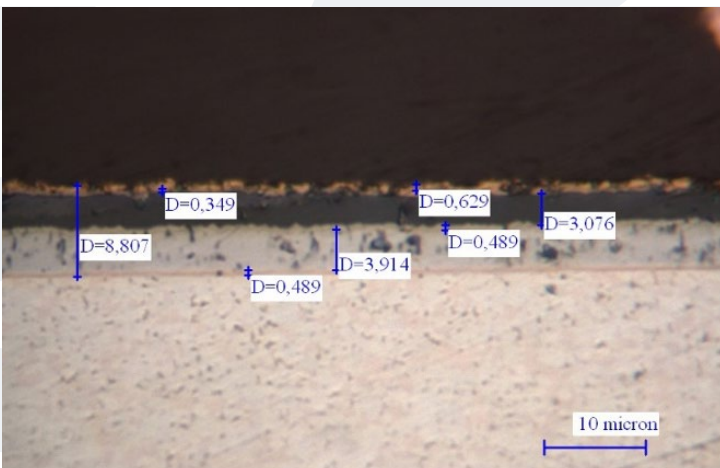
Cobalt sulphate precipitates



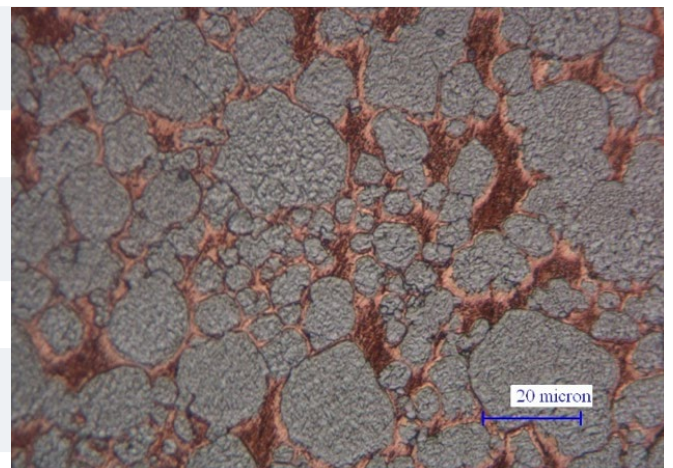
Hardmetal microstructure (OM, Murakami etched)



Hardmetal microstructure (SEM, Murakami etched)



Coating (OM, un-etched)



W-Cu (OM, Murakami etched)