Improved Method for Grinding and Polishing Cemented Carbide (WC-Co) For Metallographic Analysis Utilizing LeStar Polishing Film

LECO Corporation; Saint Joseph, Michigan USA

Instrument: GPX-200 Automatic Grinder/Polisher

Equipment Setup

GPX-200 Automatic Grinder/Polisher with a CAMEO Platinum I Grinding Disc and a 1 micron LeStar Polishing Film.

Cemented Carbides

Cemented carbides are very hard composites made by sophisticated powder metallurgy processes. They occasionally involve carbides besides the usual Tungsten Carbide (WC). The binder phase is normally cobalt (usually 6 to 12% by weight), although nickel can also be used. Metallographic studies of cemented carbides are unique, but need not be difficult. Because of their high hardness, cemented carbides are sectioned with a diamond precision saw. Their high hardness also requires that special grinding and polishing procedures be used.

Detailed are two procedures for metallographically preparing sintered carbides for optical microscopy. The first is a "typical" procedure involving grinding with a CAMEO Platinum (diamond) disc followed by a "pre-polishing" step and two polishing steps. The second procedure involves one grinding step followed by a single polishing step, using LECO's recently introduced LeStar diamond polishing film consisting of spherical particles composed of a primary diamond and nanoparticles. This streamlined procedure provides a comparable polish in less than half the time, with lower consumables costs.

Preliminary Sample Preparation

Sample Identification

Grade C-2 Cemented Carbide
[94% Tungsten Carbide – 6% Cobalt]

Sectioning

Saw	VC-50
Blade	5" x 0.025" – Diamond Blade (P/N 802-439)
Speed (RPM)	500
Coolant/Rust Inhibitor	P/N 811-023

Mounting

Press	PR-32
Media	Bakelite
Other Comments	P/N 811-111 "Normal Cycle"

Typical Metallographic Preparation Method

Grinding - GPX200 (10" Wheel) - Fixed Sample Holder

	Time (Min:Sec)	Head Direction	Head Pressure (Pounds)	Head Speed (RPM)	Wheel Direction	Wheel Speed (RPM)
Platinum #1 (812-337)/Water	2:00	CW	35	75	CCW	200

Pre-Polishing - FAS Magnetic System/10"/(812-382)

	Time (Min:Sec)	Head Direction	Head Pressure (Pounds)	Head Speed (RPM)	Wheel Direction	Wheel Speed (RPM)
Silver Disk/ 6 µm Cameo Suspension/Microid Extender (812-340/812-356/811-003)	2:00	CW	35	75	CCW	200

Polishing

	Time (Min:Sec)	Head Direction	Head Pressure (Pounds)	Head Speed (RPM)	Wheel Direction	Wheel Speed (RPM)
3 µm Premium Suspension/Ultra Silk/ Microid Extender (810-997-016/812-438/811-003)	3:00	CW	40	100	CCW	200
1 µm Premium Suspension/Red Felt/ Microid Extender (810-998-016/812-225/811-003)	0:30	CW	40	100	CCW	200

Etching

	Time (Min:Sec)
Murakami's	00:20 to 00:30

Total Preparation Time

Approximately 13 Minutes

Metallographic Application Note

Delivering the Right Results

Improved Metallographic Preparation Method

Grinding - GPX200 (10" Wheel) - Fixed Sample Holder						
	Time (Min:Sec)	**Head Direction**	**Head Pressure (Pounds)**	**Head Speed (RPM)**	**Wheel Direction**	**Wheel Speed (RPM)**
Platinum #1 (812-337)/Water	2:00	CW	35	75	CCW	500

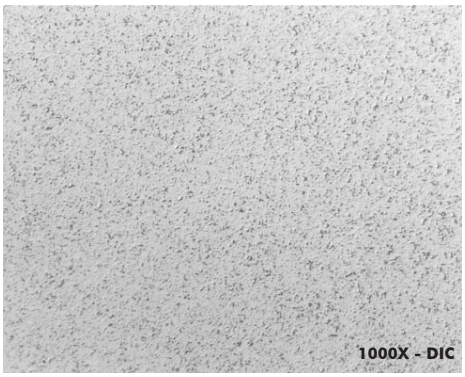
Polishing - 1 µm LeStar Diamond Film/Water						
	Time (Min:Sec)	**Head Direction**	**Head Pressure (Pounds)**	**Head Speed (RPM)**	**Wheel Direction**	**Wheel Speed (RPM)**
1 µm LeStar Diamond Film (812-488) /Water	2:00	CW	35	75	CCW	500

Etching	
	Time (Min:Sec)
Murakami's	00:20 to 00:30

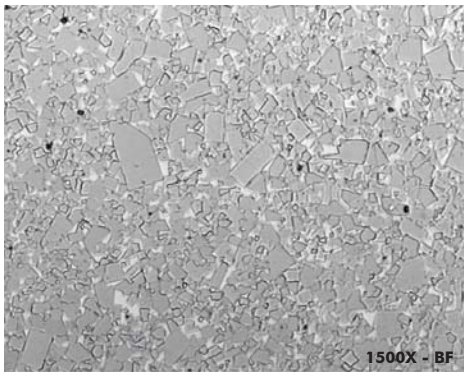
Total Preparation Time
Approximately 8 Minutes

Conventional Metallographic Preparation

Sample after grinding with Platinum I disc.



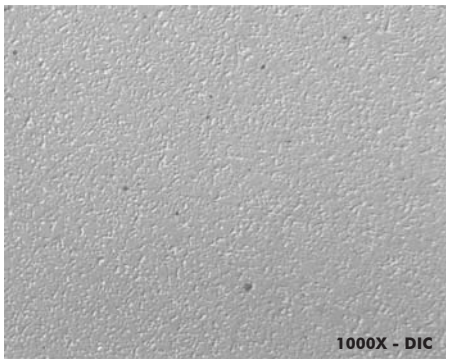
Sample after grinding and conventional polishing.



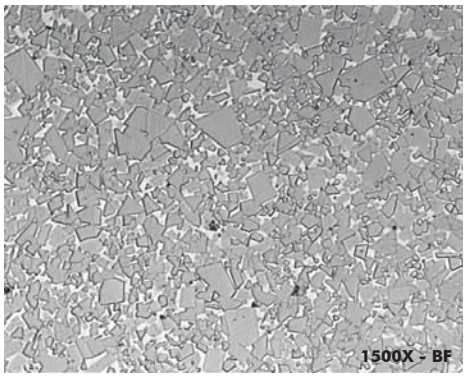
After conventional grinding, polishing, and etching.

Metallographic Preparation with LeStar Polishing Film

Sample after grinding with Platinum I disc.



Sample after Platinum I grind and LeStar polish.



After grinding, LeStar polishing, and etching.

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Delivering the Right Results