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Research-Based Lecture

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KSF

Productivity increase through spark erosion conditioned diamond/CBN grinding wheels

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Overview

- Introduction and motivation
- Spark erosion conditioning of CBN and diamond tools
- Use of spark-erosion conditioned tools for grinding
- Spark erosion profiling of innovative PCD dressing tools

Introduction and motivation

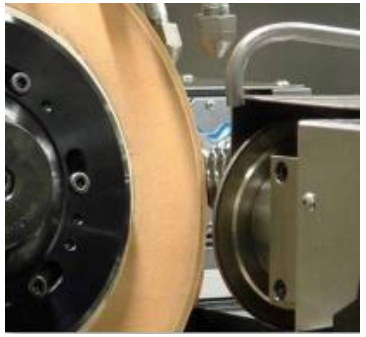
Dressing

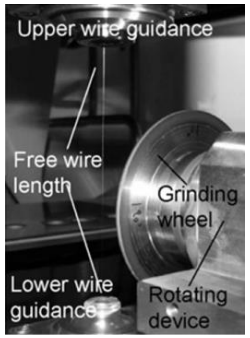
Mechanical dressing

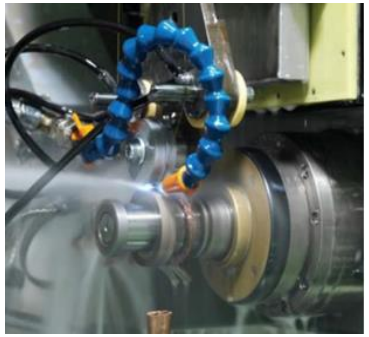
Thermal dressing

Electro-assisted dressing process

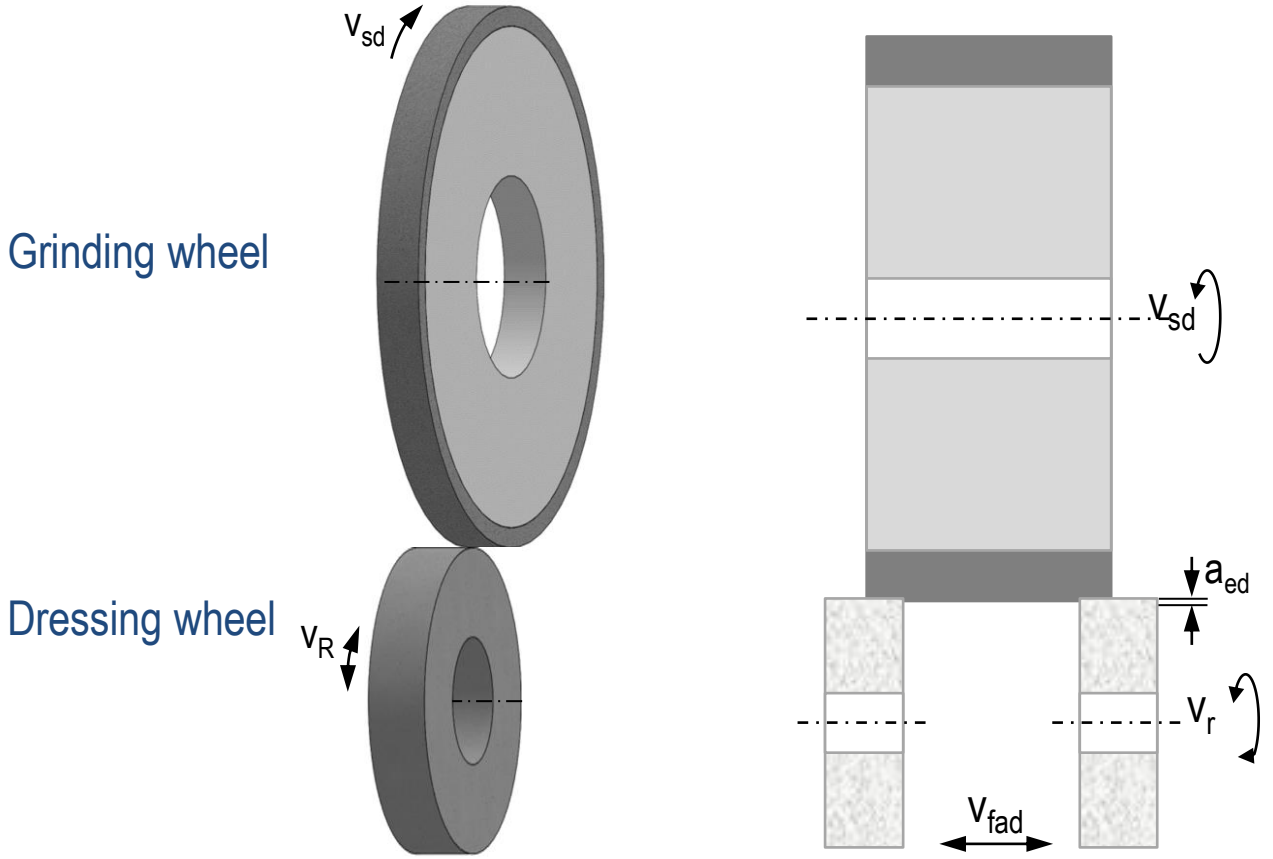
Hybrid process





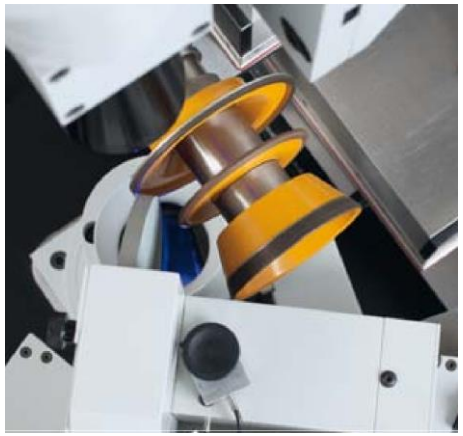


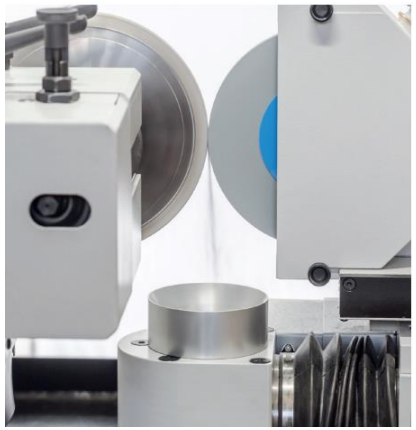
Mechanical dressing of resin, metal and hybrid bonded grinding wheels

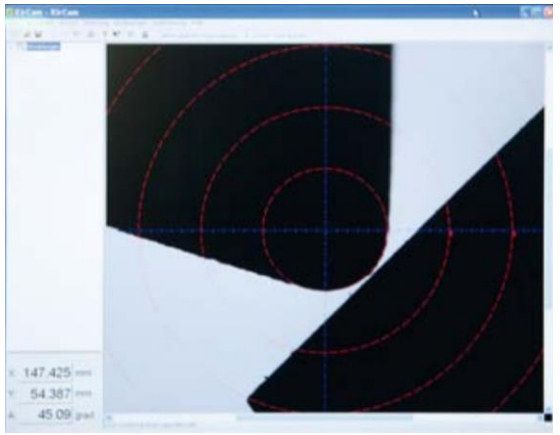


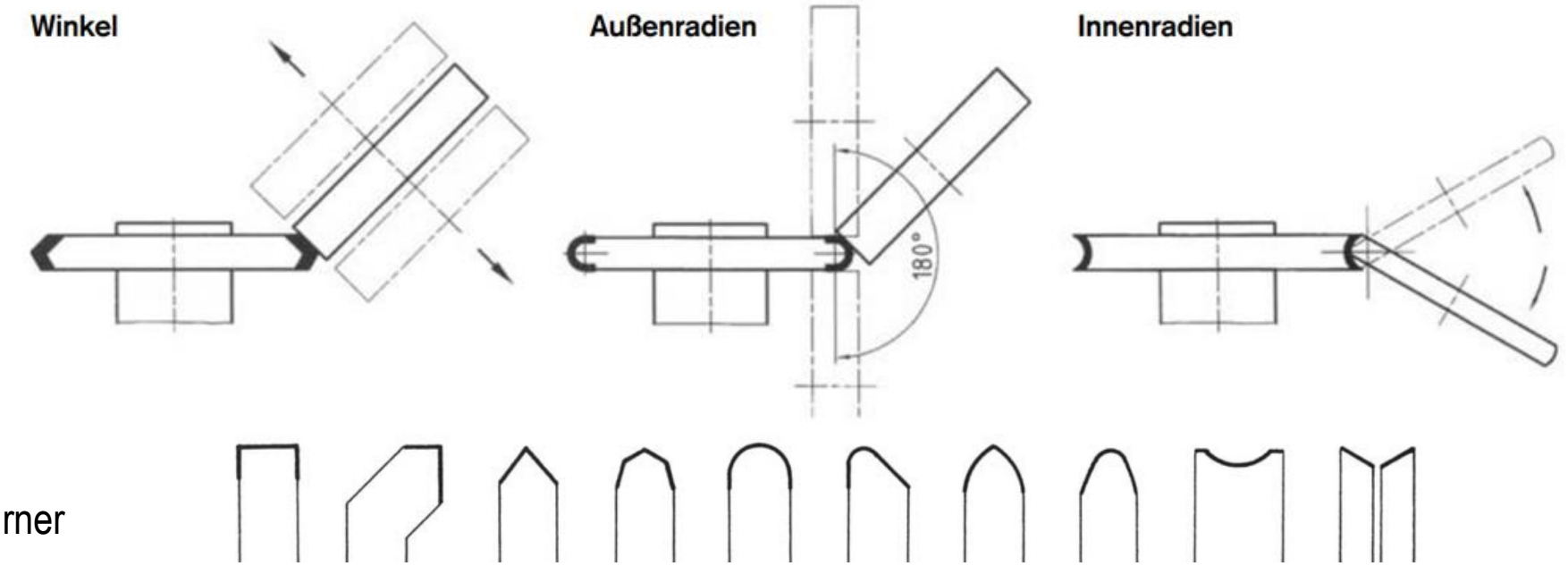
Dressing with ceramic bonded SiC or Al_2O_3 (corundum) dressing wheels

Profiling and dressing machine (Mechanical dressing)





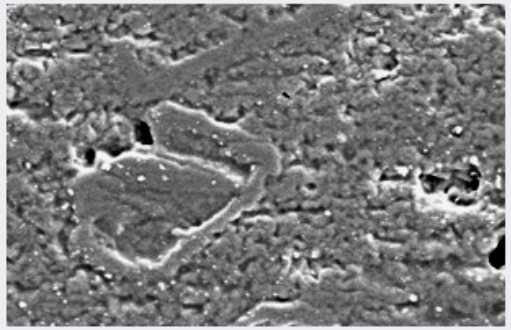




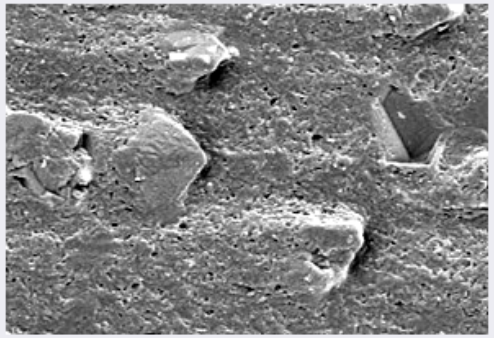
Source: Kirner

Mechanical dressing and sharpening

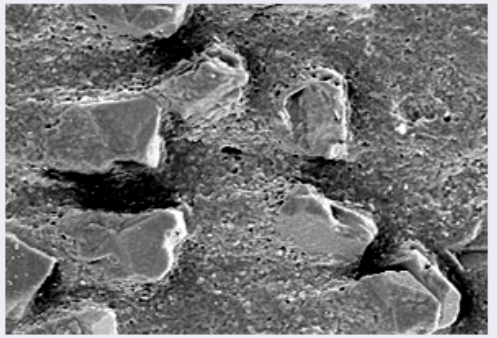
Schleifscheibentopographie nach dem Profilieren



Schleifscheibentopographie nach dem Schärfen bis zum V'_{Ws} = 1800 mm³/mm



Schleifscheibentopographie nach dem Schärfen bis zum V'_{Ws} = 3600 mm³/mm



Schleifscheibe
- kunstharzgebundene B91 C100 B

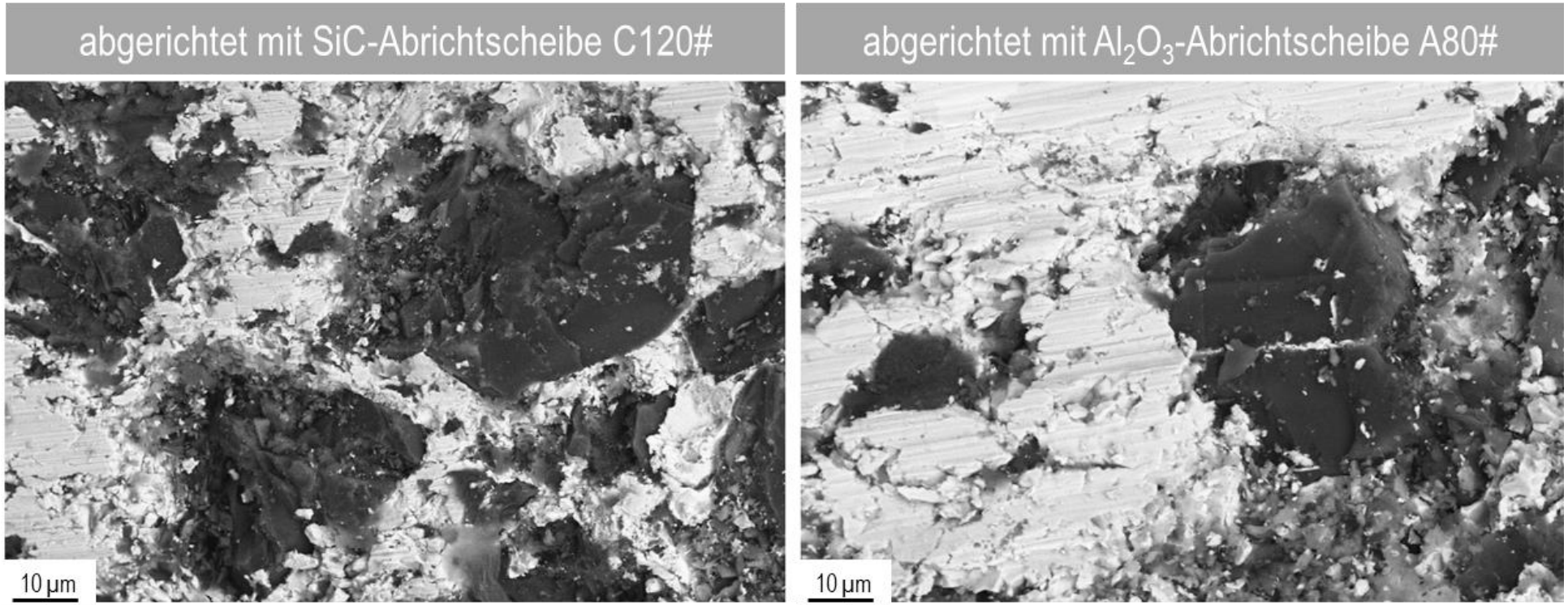
Kühlschmierstoff
- Lösung (5%-ig)

Schärfverfahren
- Blockschärfen

Schärfbedingungen
- v_{cs} = 60 m/s
- Q'_{Ws} = 500 mm³/mm.s

Mechanical dressing of resin, metal and hybrid bonded grinding wheels

D54C100M



Source: Tyrolit

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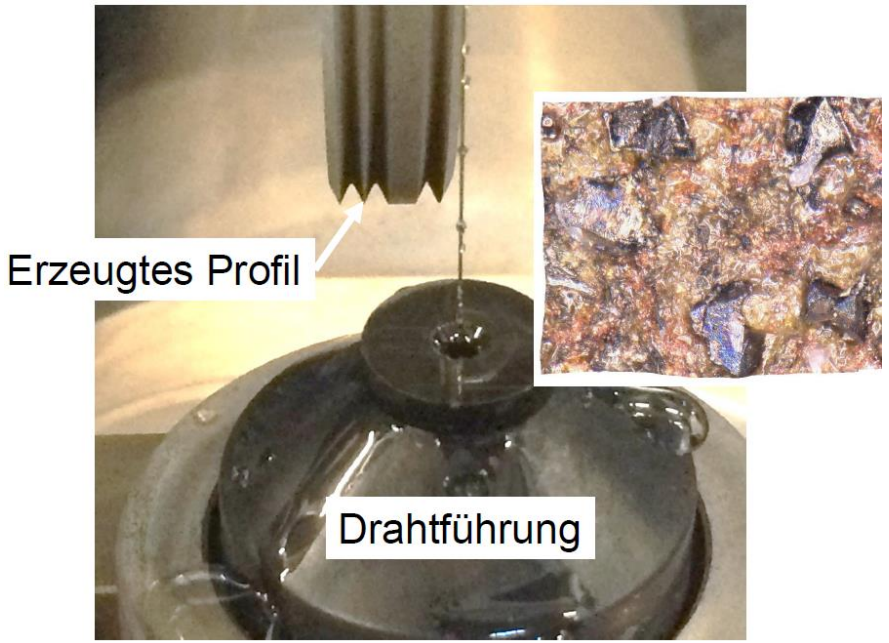
Machine structure

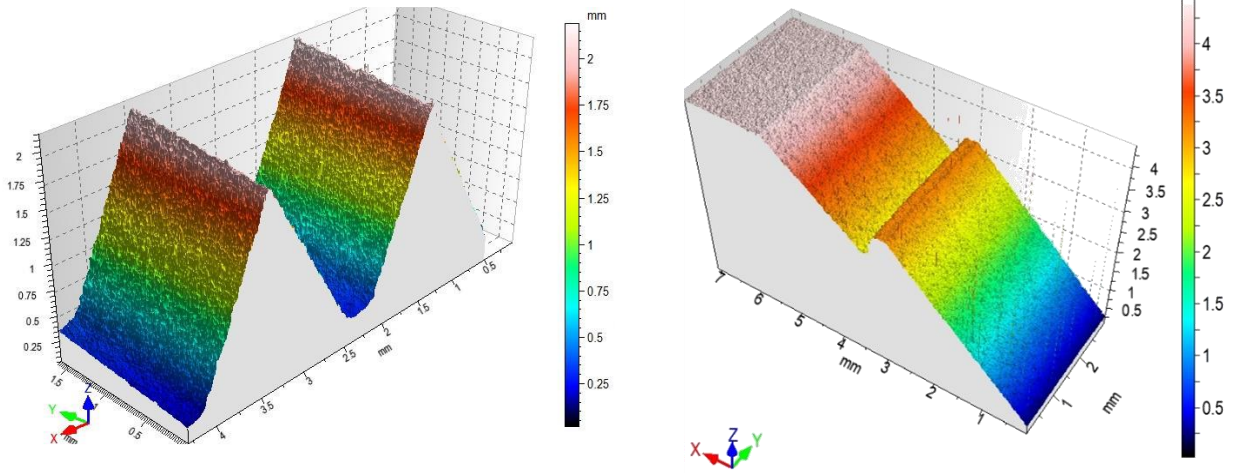
- Design of an eroding process for conditioning grinding wheels

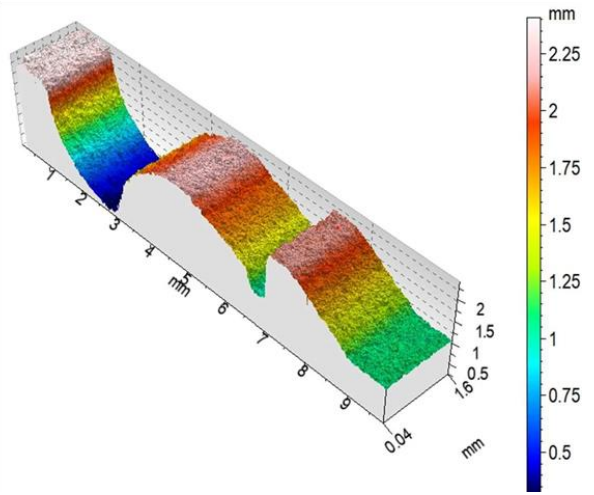
MP2400 D-CUBES

Spark erosion profiling of grinding wheels

- Creation of freeform profiles







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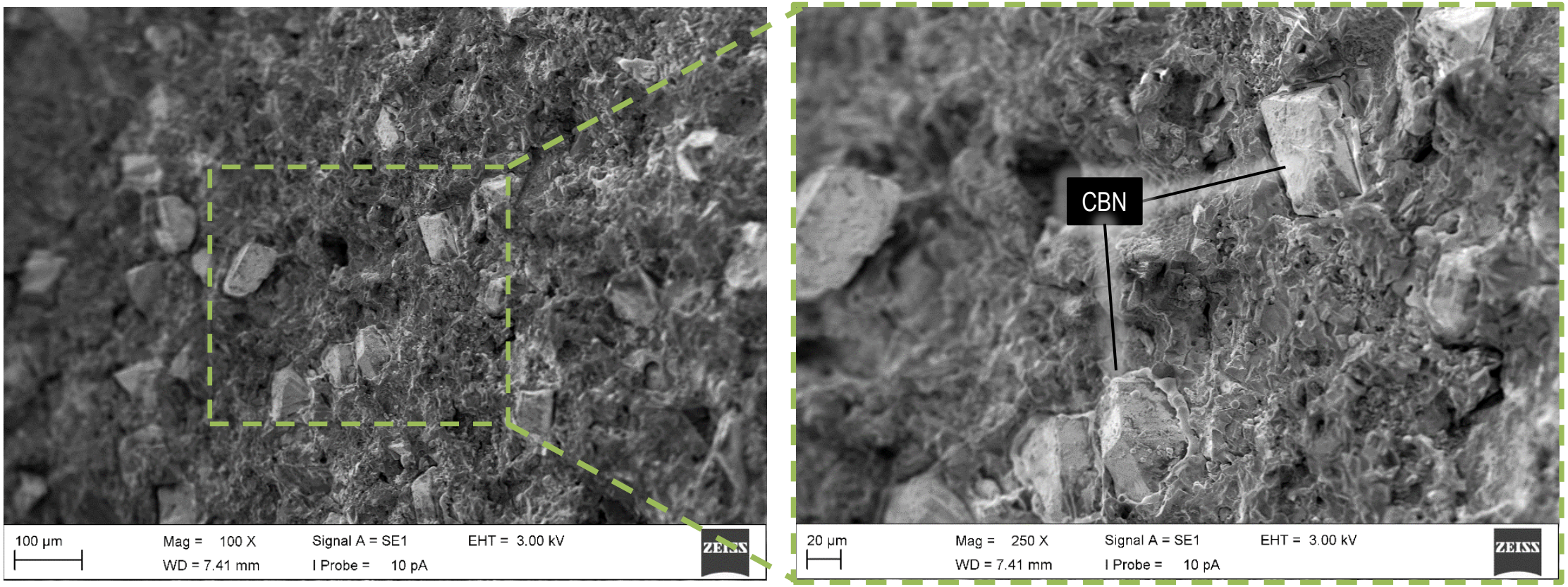
Spark erosive conditioning - microtopography of the grinding tool

- Grain protrusion (B76 C75 BHR)

mechanically conditioned eroded

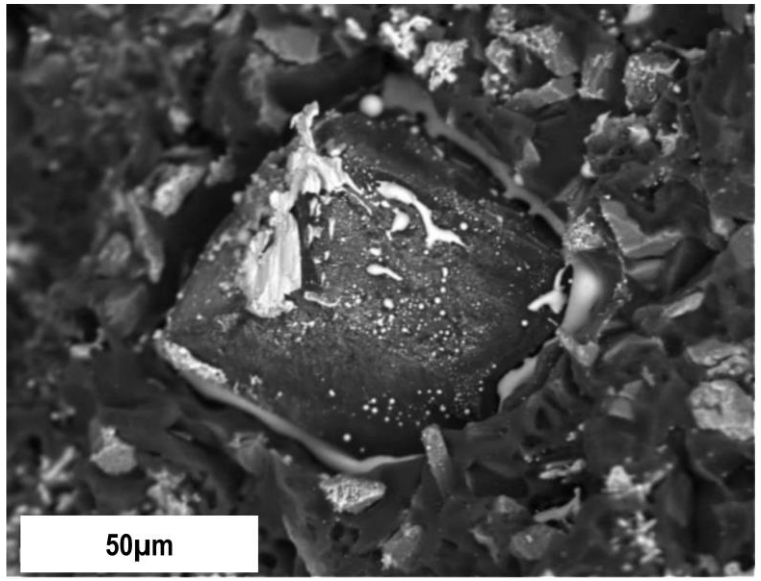
Spark erosive conditioning - microtopography of the grinding tool

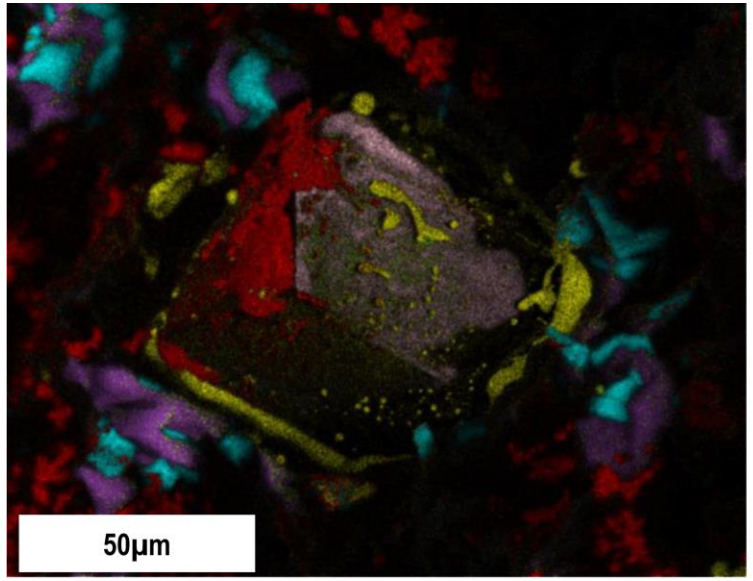
- Grain protrusion (B76 C75)



Thermal aspects of eroding

- Material analysis by means of SEM and EDX examinations
  - Grain protrusion (left) and thermochemical relationships in the EDM process





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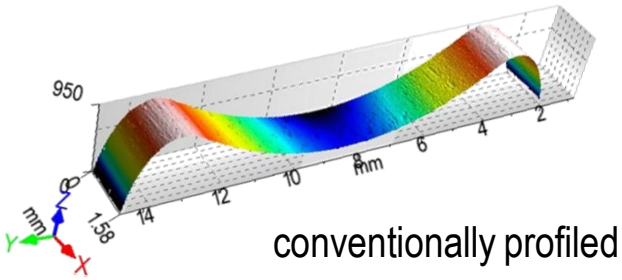
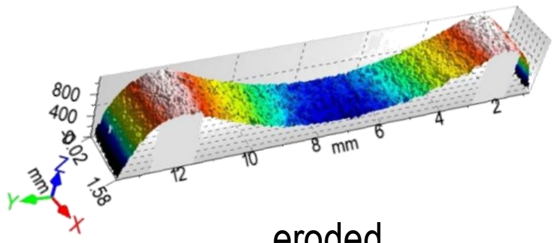
- Influence of erosion parameters on the microtopography of the grinding wheel
- Spark erosion profiling of innovative PCD dressing tools

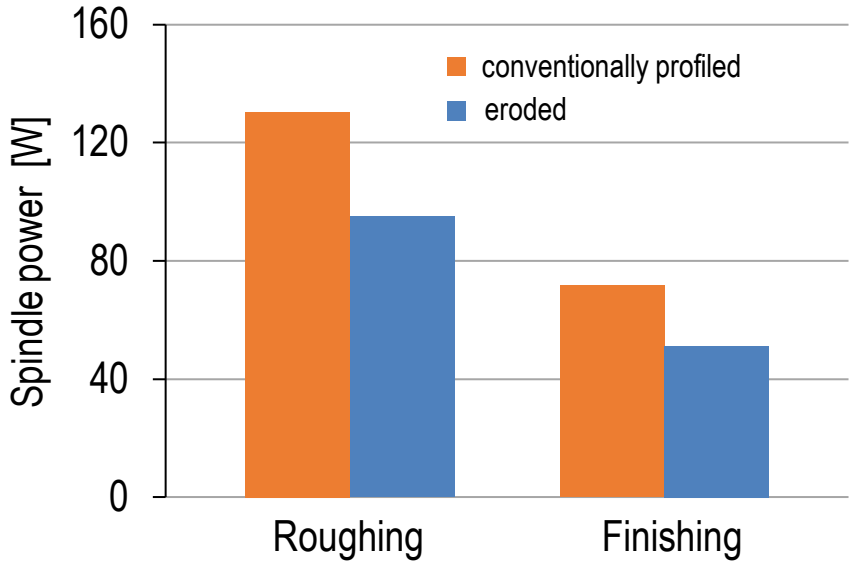
Grinding performance – Al_2O_3

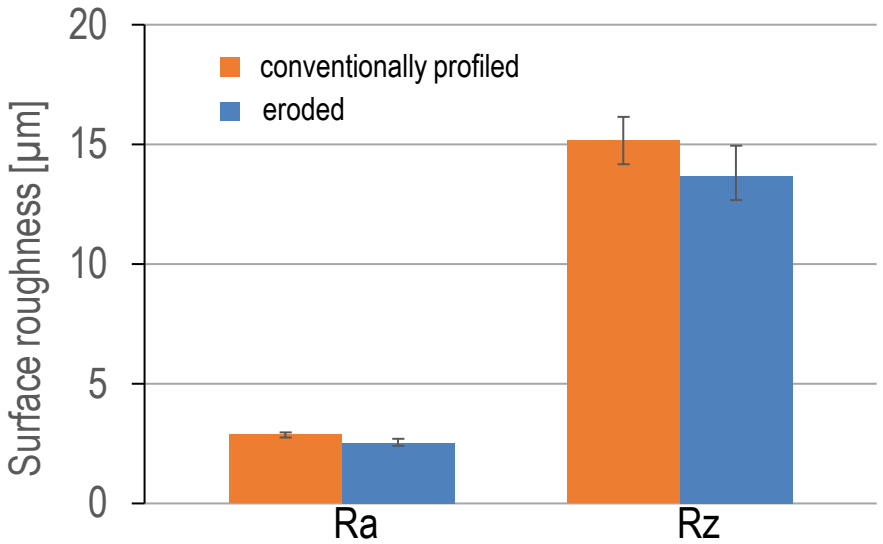


conventionally profiled



eroded





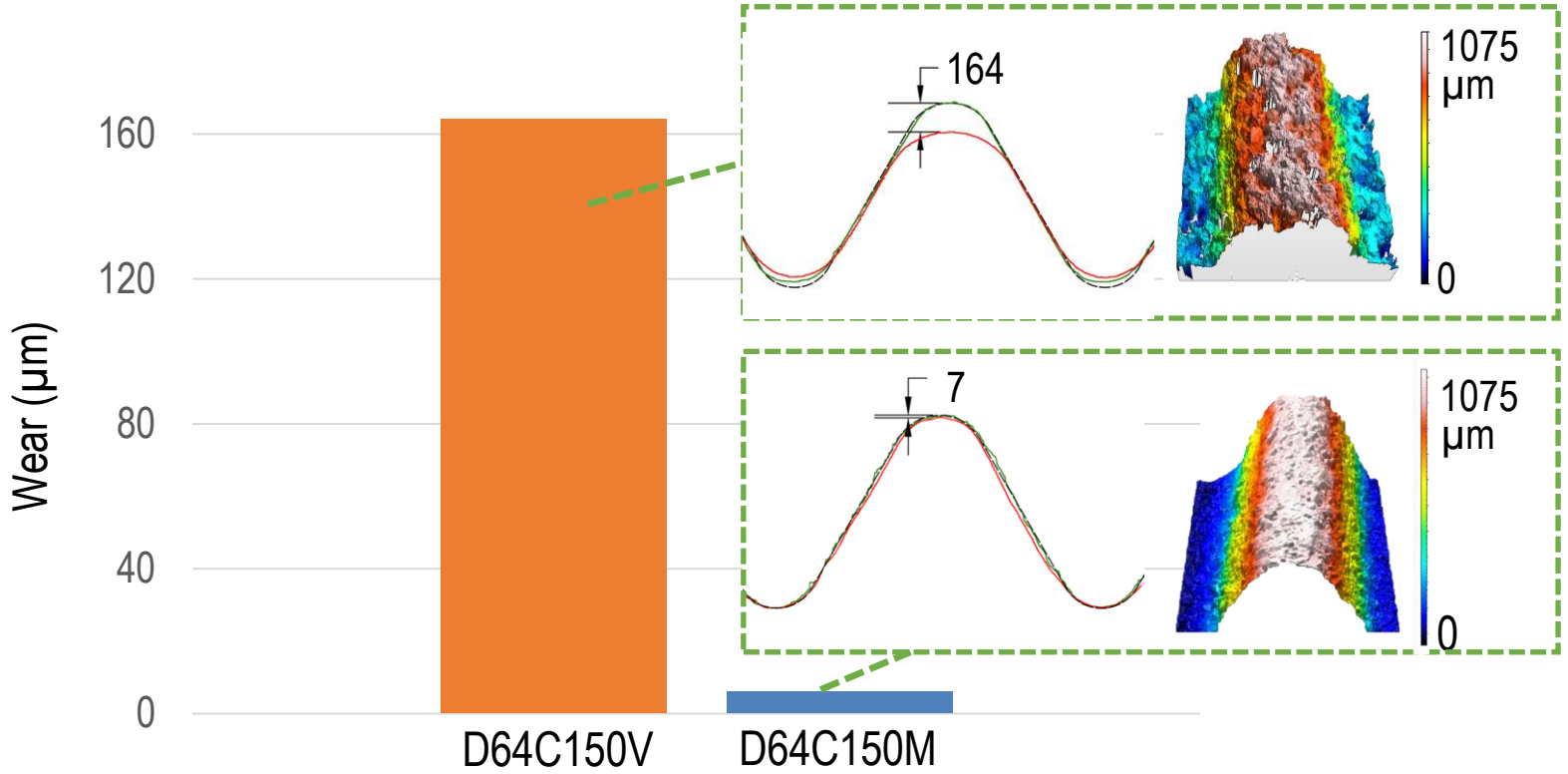
Grinding wheel
- D76 C50 B

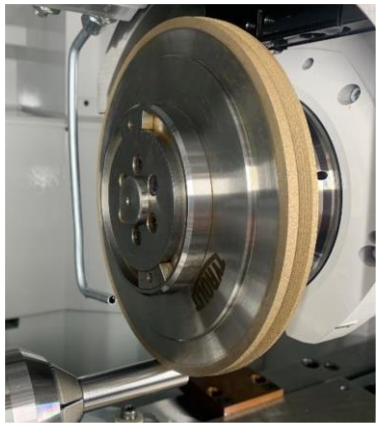
Workpiece
- Aluminiumoxid AK99,5

Grinding Parameters
- v_c = 35 m/s
- v_{fr} = 0,5 - 1 mm/min
- q_s = 90-150
- t_s = 2 s
- Grinding oil

Radial tool wear for mechanically and spark erosion conditioned grinding wheels

	Ceramic bond	Metal Bond
Conditioning	Diamant Dressing roll, v_{cd}: 60 m/s, q_d: +0,8, U_d: 2, a_{ed}: 4 µm	Eroding: 3 (E109, E110, E109)
Grinding	v_c: 60 m/s, q_s: 80-120, Q‘w: 3 mm³/mm.s, KSS: Öl	v_c: 60 m/s, q_s: 80-120, Q‘w: 3 mm³/mm.s, KSS: Öl





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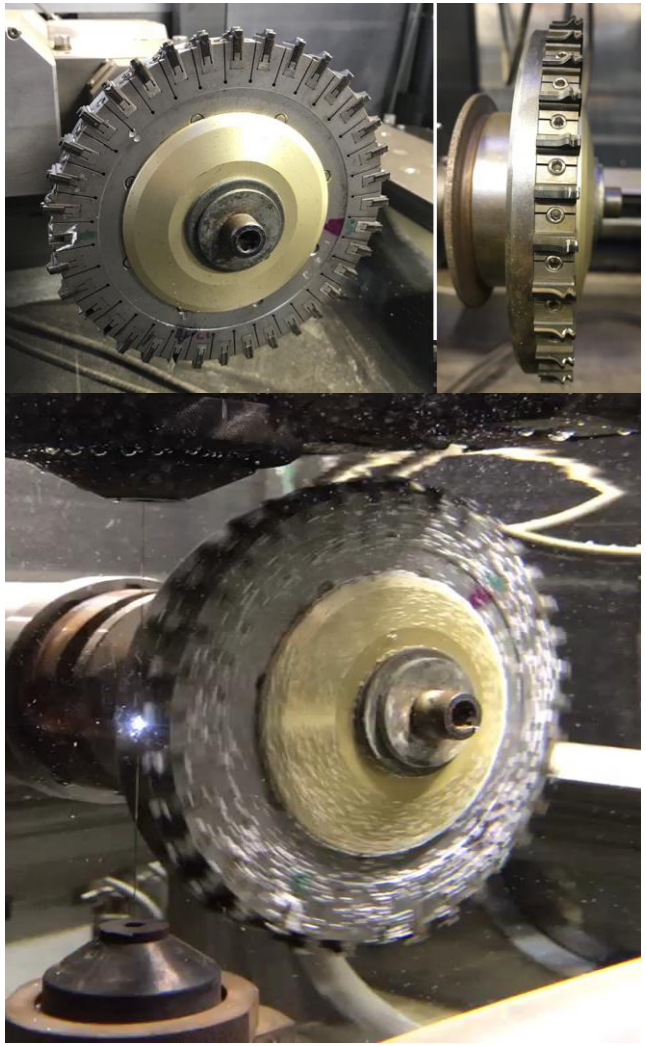
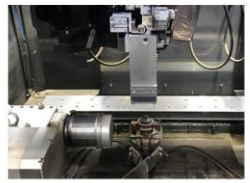
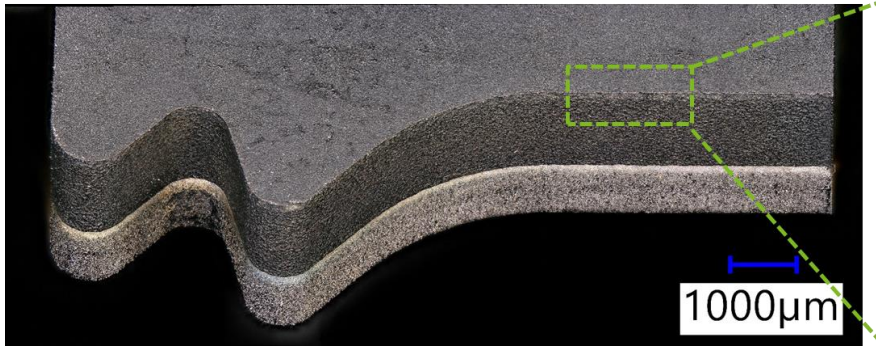
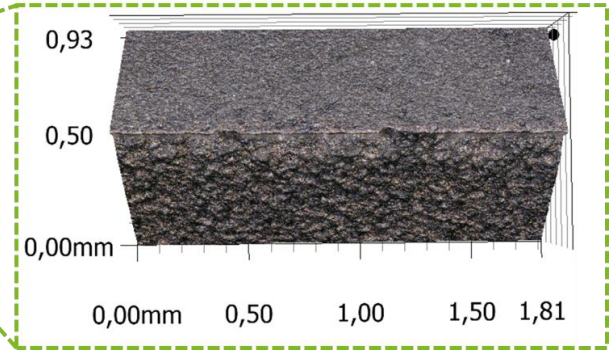
Spark erosion profiling of innovative PCD dressing tools









Summary

- Wire EDM as an efficient, safe and innovative conditioning process
- complicated profiles / reduced number of grinding wheels for complex geometries
  - Fine internal contours on the grinding tool, higher grain protrusion
- Micro-topography of the grinding tool that is conducive to chip removal
- Optimized profile stability and accuracy
- Reprofiling capability without reclamping
- Man-less conditioning