Leroxid®
Erodierbare Keramik

DIMACER®
Conductive high-performance ceramic.

Starting point.

Injection moulding of abrasive materials like fibre reinforced plastics, metals and ceramics causes after a number of cycles even in critical regions, i. e. the sprue bush (injection moulding of fibre reinforced polymers) and filigree or sharp-edged points (MIM, CIM) significant wear within the mould. To handle such materials economically, wear-resistant mould inserts are required, for which high performance ceramics because of their excellent tribological properties are perfectly suited. However, they have to meet three

Challenges:

1. Thermal expansion and conductivity have to be matched to the surrounding steel. Only when this is done correctly the excellent corrosion and wear resistance of the ceramic material can be exploited.

2. The ceramic mould inserts have to be machined by one of the basic methods of mould making, the spark erosion technologies.

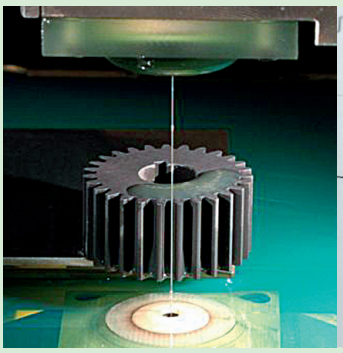
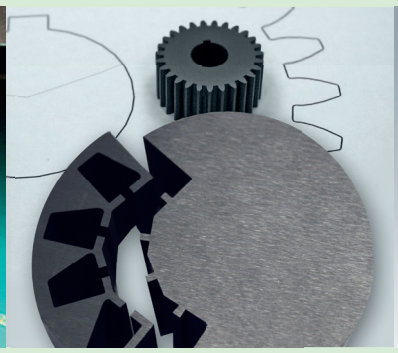
3. The insertion of electrical conductive material may not cause a loss of strength and toughness.
No material could fulfill this claim so far.

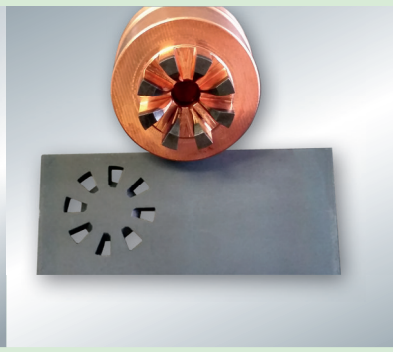
Solution.

Leroxid® and Leonhardt Graveurbetrieb in close cooperation with the Institute for Manufacturing Technologies of Ceramic Components (IFKB) at the University of Stuttgart have developed a new ceramic material formulation with a significantly reduced amount of conductive component.

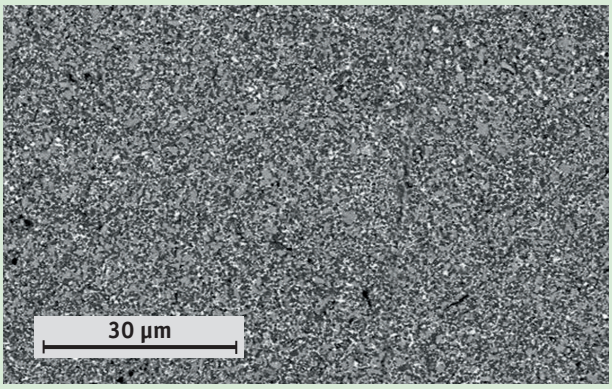
The result:

Dimacer® – a high-performance ceramic
– which is electrical conductive and can be machined by EDM and
– is equal in strength and toughness to the undoped material



Dimacer® convinces:
Not only its developers – above all its users.



Typical microstructure of the electrical conductive ceramic Dimacer®

Properties.

- High hardness
- Good mechanical strength and fracture toughness
- Hardness and elasticity can be varied depending on the application, i. e. by platelet reinforcment
- Electrical conductivity

Examples for applications.

- Wire EDM of a gear from Dimacer® for testing the wear resistance in dry friction
  Result: No signs of wear after more than 100 hours of continuous exposure
- Punching trials
  Result: Dimacer® can also be used as a cutting device for punching
- Processing using wire EDM UPV3 with oil bath (Makino)
- Processing by spark erosion EDAC1 to EDAF2 (Makino) is possible
  Result: Reproducible manufacture of filigree parts with tight tolerances

Utilization.

- Production of DIMACER® mould inserts for GRP, MIM and CIM moulds by conventional tool and mould making process
- Material for manufacturing of injection moulds for miniature and micro parts
- Use in extrusion dies

Dimacer® – machinable oxide ceramic material by EDM.

- Base: alumina matrix material
- Electrical conductive hard particles: titanium carbide in a concentration of 24 volume percent
- Additional to avoid the embrittlement of the material: metastable tetragonal zirconia

Technical data		
Density	ρ [g/cm³]	4,53
Hardness (Vickers)	HV10	1850
Hardness (Rockwell)	HRC	> 90
Young's modulus	E [GPa]	400
Flexural strength [1]	σ_{4P} [MPa]	780
Fracture toughness [2]	k_{Ic} [MPa$\sqrt{m}$]	5,8
Thermal expansion	α [*10^{-6}/K]	8,2
Thermal conductivity (RT)	λ [W/mK]	18,5
Thermal conductivity (400 °C)	λ [W/mK]	11,3
Electrical conductivity	σ [S/cm]	49

[1] 4-point (DIN EN 843-1)
[2] Vickers indention HV 10 (Niihara)

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Leroxid®
Dr. h. c. Wolfgang Leonhardt
Mozartstraße 26
73269 Hochdorf
Germany

Fon +49 (0) 7153 / 95 94-0
Fax +49 (0) 7153 / 95 94-99

info@leroxid.de
www.leroxid.de