plasbor®

LWK Armouring Technology

Extreme hardness for metal tools

plasbor – an economical high tech approach

Boriding is a thermochemical surface treatment for ferrous metals where boron diffuses into the metal surface to provide an extremely hard and wear-resistant surface layer.

The method is suitable for components which are exposed to extreme adhesive wear or abrasion and where other treatments (e.g., nitriding, flame, induction, and case hardening) reach their limits.

All ferrous materials as well as numerous high alloy steels are suitable for boriding.

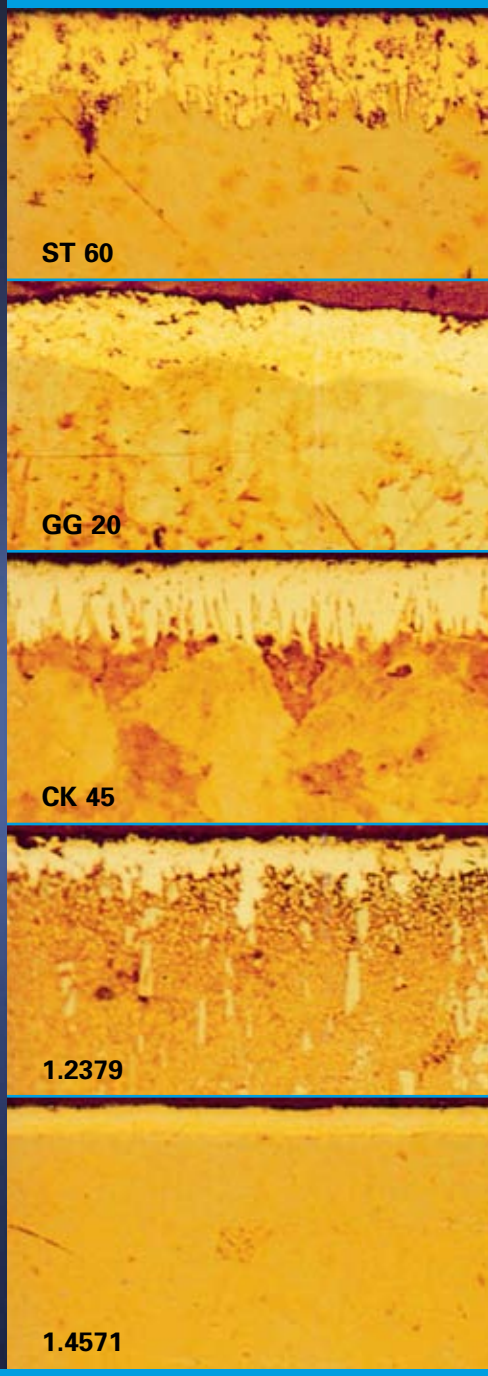
The material to be borided determines:

- Boriding temperature, i.e., between 800 and 1000 °C
- Boride layer thickness, i.e., between 10 and 300 µm
- Surface hardness, i.e., between1600 and 2000 HV
- Adhesion between the boride layer and the base metal following various degrees of indentation, see micrographs of boride layers
- Dimensional changes (of the component) after boriding

Various base material properties are clearly enhanced by boriding, including:

- Surface hardness - 3 times higher than before boriding and twice as high as after nitriding or hardening
- Hot hardness
- Greatly reduced tendency to cold welding
- Corrosion resistance to alkali and non oxidizing acids
- Erosion resistance
- Cavitation resistance

Micrographs of boride layers of various materials:



to give an extended service life

After boriding, a number of features remain unaffected, including:

- Resistance to heat shocks
- Thermal conductivity
- Electric conductivity
- Thermal expansion
- Material elasticity

Borided components can be exposed for a short period of time to temperatures of up to 1000°C.

The maximum permanent working temperature is approx. 500°C.

Technical process features:

- Very economical as a result of low tool costs
- Selective/partial boriding is possible
- Subsequent hardening of the metal core is possible
- Original surface finish remains virtually unchanged
- Optimum fail-safe features
- Post machining of the parts is possible, but is not needed in most cases
- Sharp edges should be avoided
- Components up to 3200 x 2000 x 900 mm can be borided, larger dimensions upon request.

Applications

- Mechanical engineering
- Chemistry
- Petrochemistry
- Glass industry

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Materials suitable for boriding

For LWK-Hartbor hard-facing, various groups of materials may be used, including:

- All iron based alloys
- Structural steel, case-hardened steel, tool steel, stainless steel
- Armco iron, cast iron
- Carbides (hard metals)
- PM qualities

The maximum Si content should be 1.00 %, the Al content should be less than 0.005 %.

Low alloy steels are more prone to layer deposition than high alloy stainless steels.

Exposure: gliding friction abrasion	St 00 C 10 CK 10 C 15 WS 105 Cr 2–105 Cr 4 100 CrMn 6	– St 70.2 – C 68 – CK 60 – C 85 WS – 100 Cr 6 – 100 CrMo 6		(1.0030 – 1.0632) (1.0031 – 1.0627) (1.1121 – 1.1221) (1.1805 – 1.1830) (1.3501 – 1.3505) (1.3520 – 1.3536)
Exposure: surface and linear strain in cold forming range	115 CrV 3 105 WCr 6 45 WCrV 7 60 WCrV 7 55 NiCrMoV 6 X 100 CrMoV 5 1 X 210 Cr 12 X 165 CrV 12 X 220 CrMoV 12 2	(1.2210) (1.2419) (1.2542) (1.2550) (1.2713) (1.2363) (1.2080) (1.2201) (1.2378)	X 45 NiCrMo 4 90 MnCrV 8 16 MnCr 5 20 MnCr 5 34 CrMo 4 42 CrMo 4 X 210 CrW 12 X 165 CrMoV 12 X 4210 CrCoW 12	(1.2767) (1.2842) (1.7131) (EC 80) (1.7147) (EC 100) (1.7220) (1.7225) (1.2436) (1.2601) (1.2884)
Exposure: surface and linear strain in hot forming range	X 38 CrMoV 5 1 X 40 CrMoV 5 1 X 32 CrMoV 3 3 X 30 WCrV 5 3	(1.2343) (1.2344) (1.2365) (1.2567)	55 NiCrMoV 6 56 NiCrMoV 7 34 CrMo 4 42 CrMo 4	(1.2713) (1.2714) (1.7220) (1.7225)
Exposure: chemical wear	X 10 Cr 13 X 40 Cr 13 X 12 CrNi 18 8	(1.4006) (1.4034) (1.4300)	G X 10 CrNiMo 18 9 X 10 CrNiTi 18 9 X 10 CrNiMoTi 18 10	(1.4410) (1.4541) (1.4571)

Gate valve before...

...and after boriding

LWK applies a certified quality management system.
Member of the IHT (Industrial Association of Hardening Technology).

LWK plasma ceramic:

extended service life, enhanced resistance and higher profitability

For more than 40 years LWK has been developing methods to protect engineering components from wear.

Our high level of expertise, good flexibility, staff qualifications and maximum customer dedication by expedient order handling have made us the partner chosen by numerous companies both in Germany and abroad.

LWK has firmly made its mark in the mechanical engineering industry, industrial furnace construction, the steel, petrochemical and glass industries and many others.

Our excellent reputation is based not only on fast problem solving – even over night – but also on the constant improvement of our processes and their flexible adjustment to suit customer applications.

Our stringent quality management system ensures standardised, repeatable production workflows to give our customers the safety which they can always rely on.

LWK

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