

Graphite: An Old Material Transformed Into a New Exciting Ceramic

Boracarb™ Treatment provides-

- *Oxidation Protection to 900 C (1650 F)*
- *Greatly Enhanced Wear Resistance*
- *Electrical Insulation*

**Not a Coating
nor impregnate**

The Boracarb™ Surface Treatment -An Innovative Technological Solution

BORACARB™ is a unique ultra-high-temperature multiphase gas diffusional process that produces a “case depth” conversion layer similar in concept to carburizing of steel. The BORACARB™ case is highly wear resistant, electrically insulating, robust and protects graphite from air oxidation to 900 C (1650 F) typically for THOUSANDS OF HOURS. Treated parts may also be used in inert atmospheres to 1900 C (3450 F) and vacuum to above 1600 C (2900 F).

BORACARB™ is not a coating nor a phosphate or borate impregnate with their inherent limitations. The BORACARB™ case is married to the graphite component whereby the dimensions and weight are essentially unchanged. This permits complex, tight dimensioned parts such as screw threads to be successfully treated.

BORACARB™ is an enabling technology and allows graphite to replace traditional ceramics for many applications. Graphite offers many useful properties -- excellent thermal shock resistance, low cost, easy machinability, chemical resistance, good thermal conductivity and more. However, its use is rejected in favor of other less desirable ceramic materials because of graphite's main limitations -- oxidation in air above 450 C (850 F), lack of wear resistance and, in some cases, its electrical conductivity. All of these limitations are overcome with the BORACARB™ treatment.

No Dimensional Change

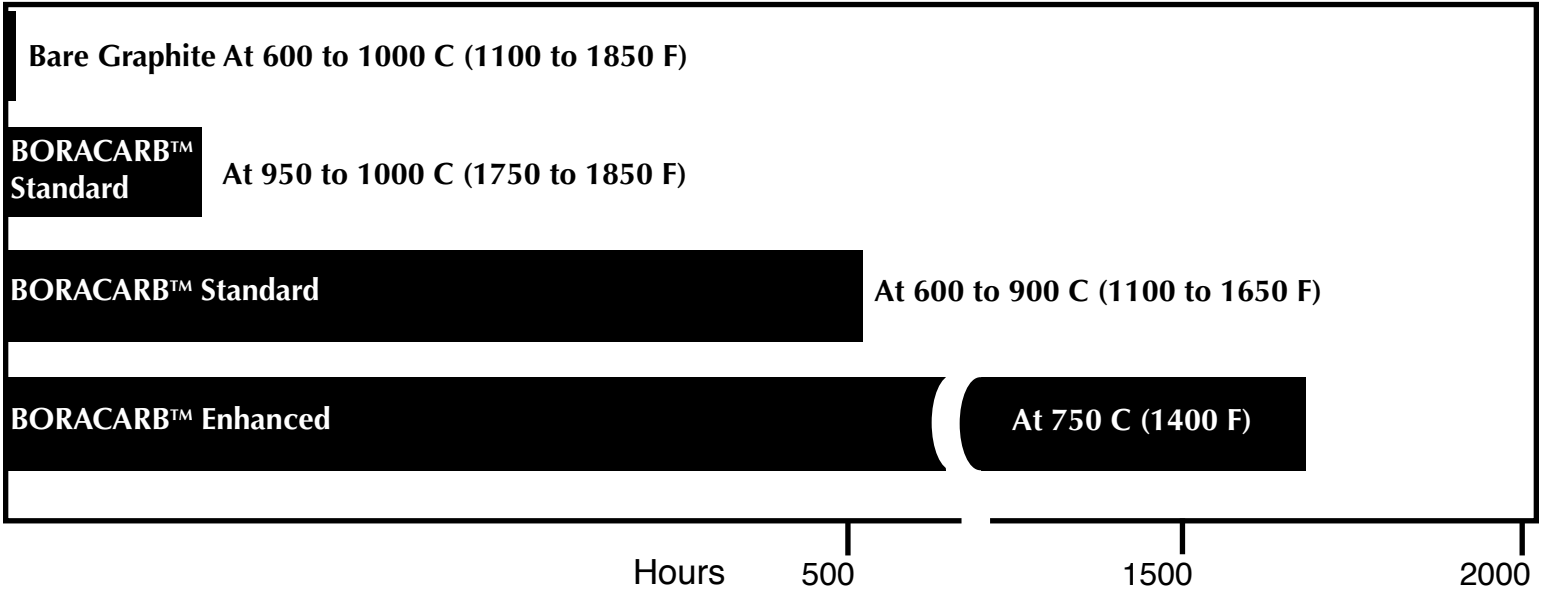
All Graphite Grades

Extremely Wear Resistant

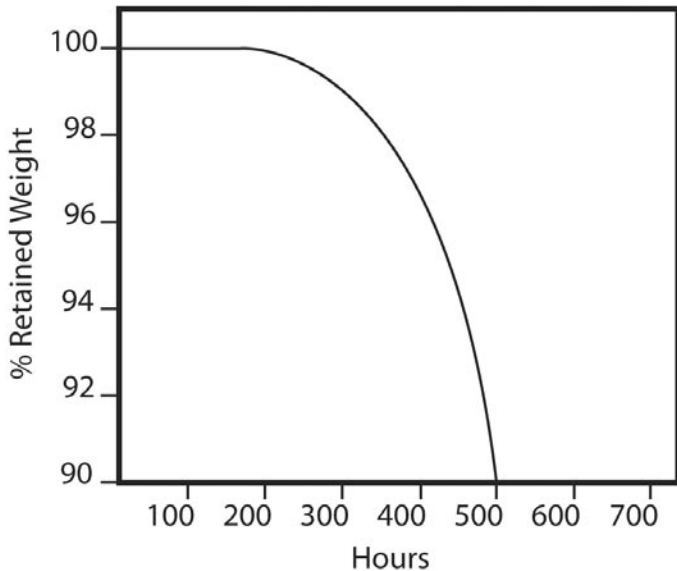
**Virtually Stops Oxidation to
900 C (1650 F)**

**Usable in Inert Atmosphere
to 1900 C (3450 F);
in Vacuum to above
1600 C (2900 F)**

Exposure Time for 10% Weight Loss



BORACARB™ -- Standard



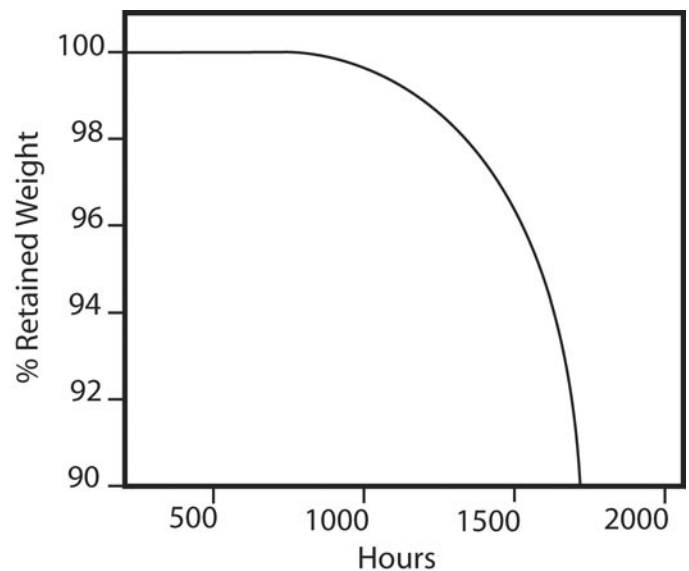
BORACARB™ -- Standard⁽¹⁾

The standard treatment yields a robust, wear-resistant, electrically insulating, oxidation protective deep conversion case with a surface dusting of powder that can be removed if desired.

BORACARB™ -- Enhanced⁽¹⁾⁽²⁾

The oxidation resistance of the standard treatment is greatly enhanced by a post heat-treatment process that produces a black, glassy surface layer.

BORACARB™ -- Enhanced



(1) BORACARB™ -- Standard or Enhanced treated graphite often forms a “tacky” surface upon continued exposure at elevated temperatures in air.

(2) It is not uncommon that one or more parts of a new design may be consumed in testing during development of appropriate fixturing for the enhanced treatment.



ZYP Coatings, Inc.
120 Valley Court
Oak Ridge, TN 37830
Ph: (865) 482-5717
FAX: (865) 482-1281
email: info@zypcoatings.com

PARTS SUBMISSION DETAILS

- Components must be machined to final dimensions.
- Sizes are currently limited to approximately 5-inch diameter by 44 inches long.
- Material to be treated MUST BE 100% CARBONACEOUS -- NO ADDITIVES such as boride or phosphate treated graphite.
- Specify desired treatment -- BORACARB™ Standard or BORACARB™ Enhanced.

Contact

email: info@zypcoatings.com

Ship to:

ZYP Coatings, Inc
120 Valley Court
Oak Ridge, TN 37930
attn: BORACARB facility

Disclaimer: ZYP Coatings, Inc. ["ZYP"] makes, and Purchaser receives, no warranties, express or implied, regarding the accuracy and/or applicability of the underlying data and/or testing on which the products are based. ZYP makes, and Purchaser receives, no warranties, express or implied, regarding the accuracy of any recommendations made by ZYP. ZYP specifically disclaims any warranty of merchantability or fitness for a particular purpose. Product is sold "AS-IS." Purchasers should undertake their own testing to ensure suitability of the Product for their use.

In no event shall either party be liable for indirect, special, incidental, exemplary, punitive, or consequential damages, loss of profits, loss of use, or data or interruption of business, whether such alleged damages are labeled in tort, contract or indemnity, even if such party has not been advised of the possibility of such damages.

The provisions of this Agreement and any Attachments, by their terms, constitute the entire agreement between the parties and supercede all prior agreements, oral or written, and all other communications relating to the subject matter hereof.