High Performance C/C-SiC brake discs
High-Tech materials from space craft

Rising power drives of modern vehicles and higher speeds require thermally stable brake systems, which must meet the requirements of the lightweight construction in ever stronger measure. In comparison to conventional grey cast iron brake discs, the C/C-SiC ceramics show a clearly smaller density. In contrast to C/C, the ceramic matrix composites show superior tribological properties, due to their SiC-content. The low-cost manufacturing process (LSI-process) offers a wide application field.

In cooperation with industrial partners, the C/C-SiC materials are developed further as friction materials for a new generation of lightweight brake discs. Thereby, the whole spectrum of applications is considered, e.g. compact high performance clutches, emergency brake systems, brake discs for passenger cars and large-volume brake discs for high-speed trains (ICE, transrapid).

C/C-SiC with graded lay-up. Load bearing core with SiC-rich abrasion resistant outer layers.

Graded build up confectionable material properties
A systematic fibre pre-treatment offers the manufacture of graded materials, whose ceramic content is targeted over the thickness of the construction unit. This makes an inherently tough core, which offers a sufficient strength, and a outside ceramic layer, which demonstrates an additional high wear resistance. The outstanding tribological behaviour of the C/C-SiC materials and the possibility of adapting their structural composition to the respective application make various brake disc and friction lining applications possible.

Custom-made design - brakes of high functionality and economy
High speed brakes pose extreme demands to the strength and thermal shock stability of the materials used and require a material based design and dimensioning of the single components. The complete process chain, covering the selection of the raw materials up to the mechanical finishing of the sub-components, as well as many years of experience in component design enables the tailoring of the C/C-SiC materials and the component design to the most different applications and system requirements.

The process chain is supported by extensive non-destructive testing methods, e.g. thermography, ultrasound, X-ray and CT-investigation. The DLR is a competent partner for the development of new high speed friction systems - from the design of the construction unit, the prototype manufacture up to the preparation for a series-production stage.

C/C-SiC with graded lay-up. Load bearing core with SiC-rich abrasion resistant outer layers.

Coated C/C-SiC brake disc based on a one-piece preform, manufactured in net-shape technique.

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