

Corporate Communications

CeramTec corporate contact:
Christoph Hermes
Head of Communication
Phone +49 (0) 7153 611-803
E-mail: pr@ceramtec.de

Press contact echolot pr:
Barbara Geier
Phone +44 (0)7983 242 195
E-mail: geier@echolot-pr.de

Press Information

New material for new energies

CeramTec with novel ceramic substrate for power electronics

Plochingen, 17 May 2022. Presented at last week's PCIM Europe 2022 trade fair in Nuremberg, AIN HP is a new high-performance substrate by ceramics specialists CeramTec. AIN stands for aluminium nitride, a material with excellent thermal conductivity ideal for use in power converters in rail vehicle construction or in the alternative energy sector. HP means high performance and expresses the material's superior flexural strength of 450 MPa (megapascals).

With the development of AIN HP and other high-tech substrates in the pipeline for this year, CeramTec is responding to the accelerated decarbonisation and electrification of many industries. The power electronics modules required for this increasing range of applications have to meet increasingly higher requirements, for example in terms of temperature resistance or miniaturisation.

With the new AIN HP substrate, CeramTec developers were able to increase the flexural strength by over 40 percent compared to the previous generation of AIN substrates. This directly benefits the durability of the final assembled power modules. Ceramic substrates such as AIN HP have a significantly higher thermal conductivity with better temperature resistance and insulation capability than PCB materials, for example. This makes such materials suitable for use in passive components, high-power LEDs or chip resistors.

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What distinguishes the new CeramTec substrate AIN HP for applications in power electronics?

Q&A with David Haßler, Portfolio Manager Electronics at CeramTec



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Why should power electronics manufacturers take a closer look at the new AIN HP ceramic substrate?

Aluminium nitride is still one of the best materials available at a reasonable price in terms of thermal performance. Power modules are becoming more and more powerful. However, if higher currents have to be converted, this also leads to more heat loss in the modules, which are becoming smaller at the same time. This results in specific requirements with regard to increasing power densities which are excellently met by AIN HP.

Over 40 percent increase in flexural strength is not something that can be achieved within a week. How long have you worked on the material?

AIN HP ist the result of about two years of development time. The high flexural strength that we have achieved ensures that the conductive metallisation does not detach from the ceramic substrate even during extreme thermal cycles, making the power converters very durable. To

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ensure this, we have had extensive – and, of course, successful – life cycle test series carried out for AlN HP.

When will AlN HP be available on the market?

We are launching the product as a substrate in the masterplate format of 138.0 x 190.5 x 0.635mm. D samples for qualification are available now. In the future, we will also offer other thicknesses.

Five arguments for CeramTec's AlN HP high-tech substrate:

- European manufacturer with long-standing experience in ceramic substrates
- Highest thermal conductivity of 170 W/mK and significantly improved performance due to increased flexural strength of 450 MPa
- Coefficient of thermal expansion similarly low to that of silicon
- Outstanding electrical insulation capacity and very good dielectric strength of >15 kV/mm

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About CeramTec GmbH

CeramTec is a leading global platform with a focus on high-performance ceramics (“HPC”) solutions, and is specialized in the development, manufacturing and sale of parts, components and products made from ceramic materials. With over a century of developmental and production experience in the HPC industry, CeramTec is a global leader in the manufacturing of advanced ceramics and engineers these materials for use in a wide variety of applications. HPC from CeramTec are used in a range of areas, including critical medical applications such as hip replacements, other orthopaedic implants, dental implants and medical equipment, and industries including mobility, electronics and also in other industrial applications. As of September 30, 2021, CeramTec’s portfolio comprised over 200 trademarks and over 600 patents, along with a wide variety of ceramic materials. With production sites and subsidiaries in Europe, North and South America as well as Asia, CeramTec maintains its presence around the globe as a manufacturer and supplier. CeramTec is headquartered at Plochingen, near Stuttgart (Germany).

CeramTec GmbH
CeramTec-Platz 1-9
73207 Plochingen
Germany

CeramTec UK Limited
Antelope Park, Bursledon Road
Thornhill, Southampton
Hampshire, SO19 7TG
United Kingdom

www.ceramtec-group.com/en/
www.ceramtec.com/linkedin