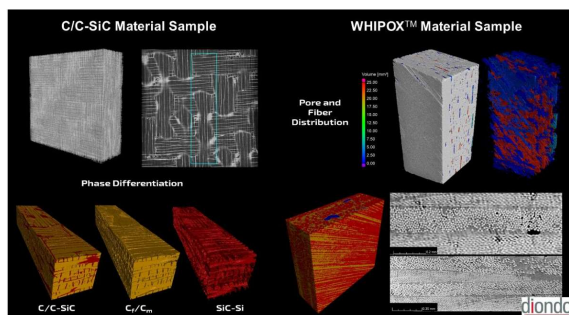


Diondo ist Hersteller und Anwender von X-Ray Systemen mit großer Expertise für CMC und CFK. // Is a manufacturer and user of X-Ray systems with great expertise in CMC and CFRP.

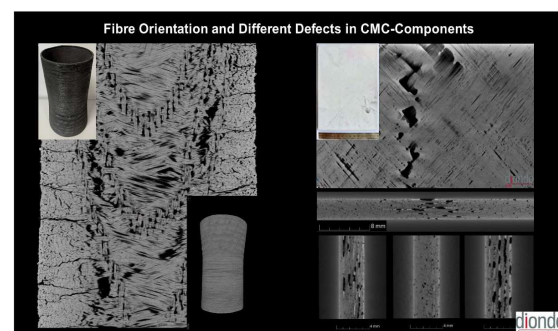
Diondo GmbH: is a leading manufacturer of innovative computed tomography (CT) systems in the field of non-destructive testing with more than 25 years' experience. Leading companies from automotive, aerospace and defence industries as well as world-class institutes are among our customers. In our in-house application laboratory that is equipped with a powerful setup of different CT systems that is unique in Germany, we provide CT scanning services as well. Our CT service customers benefit from a broad variety of CT scanners from highest-resolution micro CT for detailed materials characterization up to a 6 MeV high-energy CT system for examining larger and highly absorbent components. The successful use of ceramic composites requires a detailed understanding of the internal structure of different materials, their behaviour

and damage evolution under load, as well as possible deviations of manufactured parts from the originally conceived design. In all these cases, the non-destructive examinations with our CT systems provide valuable insights for the further development of CMC components towards their readiness for series production.

Micro-CT scans on CMC material samples with spatial resolutions at micrometre range allow us to contrast the internal material structure in three dimensions, which provides our customers with valuable information in the development of their materials. Based on the CT results, we can, for example, differentiate the different phases in the material and determine the proportion and orientation of the fibres in the matrix. By superimposing a mechanical



High-resolution micro-CT investigations for material characterization @ diondo



CT Investigations to determine fibre orientation and defects in components @ diondo

tensile or compressive load on the sample during CT testing (so called In-Situ CT, $F_{max} < 10 \text{ kN}$), we gain a better understanding of the effects of mechanical stresses on the complex material e.g. by the determination of displacement and strain fields using digital volume correlation methods. Furthermore, we gain relevant information on fibre-matrix bonding as well as crack initiation in the material. On larger CMC components, such as plates and pipes from the chemical industry or combustion technology as well as components planned for usage in aerospace engines, the CT examinations provide information on the quality of the manufacturing process.

Different features and defects such as porosity and pore distribution, delaminations and cracks are detected reliably and non-destructively and their exact position in the component is localised. Based on the CT results, measurements of the component geometry can also be carried out up to a variance comparison of the manufactured component to its CAD design. CT-based determination of the fibre orientation in the component and calculation of orientation tensors provide valuable "as-built" information that can be retroactively incorporated into virtual CMC design processes, for example. To drive the further commercialisation of CMC materials, diondo participates in public R&D projects and

continues to develop CT technology in this context in order to be able to reliably detect smaller features in larger CMC components. In addition, we are actively involved in various networks and associations that deal with issues relating to the production of fibre-reinforced composites suitable for series production.