Why not Using Ceramics – 
Trends from Ceramics Research

Within the Fraunhofer AdvanCer Alliance, four institutes have pooled their capabilities to form a coordinated range of services aimed at using advanced ceramics in the creation of individual system solutions for industrial partners. Two examples of successful project work are presented below, showing the advantages of advanced ceramics in specific industrial applications.

Ceramic product and component labelling for extreme process conditions
Many raw materials and semi-finished products are exposed to extreme conditions in manufacturing processes or in application, for example high temperatures in metal processing or the glass and ceramics production. In other areas, such as the leather industry or cleaning processes in the food and pharmaceutical branch, aggressive chemicals are used. Even climate and environmental influences place special demands on the surface of workpieces. Such extreme conditions can hinder or even render the use of an individual component labelling based on barcodes or matrix codes over the entire process chain impossible. The reasons for this are varied, for example an insufficient thermal and chemical resistance of the codes, a lack of contrast and readability or corrosion during the application of the labelling.

To meet these challenges, researchers at Fraunhofer IKTS developed the Ceracode® technology. It is based on ceramic luminescent materials for inkjet printing. For an individual labelling, a special ink with luminescent materials is being printed onto the component. Implemented as barcode or data matrix code, the labelling provides a high contrast to the subsurface, regardless of ambient conditions. The ink shows excellent adhesion to various materials and is highly resilient both thermally and chemically.

The applicability and robustness of Ceracode® has already been successfully demonstrated in the laboratory and at first pilot customer facilities. The focus of current IKTS research is on the integration of the labelling solution into existing processes. The institute succeeded in printing series components in the shortest possible time of less than 100 ms.

Today, the institute is able to offer a complete solution, ranging from the development of process-suitable ceramic inkjet inks to the generation and printing of the necessary codes and the adjustment of appropriate readers.

Contact
Dr Thomas Härtling
Fraunhofer Institute for Ceramic Technologies and Systems IKTS
E-mail: thomas.haertling@ikts.fraunhofer.de
In order to provide an effortless implementation of the coating and sealing processes into the industrial fabrication flow, the coating material is supposed to be dispersed in aqueous slurries, which are applicable via simple and cost-efficient means like spraying, painting or dipping. After drying, the coating shall be converted to a gas-tight sealing via thermal treatment. The sealing is to be stable at 1300 °C under atmospheres like air, low pressure or inert gas. During the course of the project, a coating material has been developed, which can be converted into a covering sealing layer on top of flat and cylindrical plasma sprayed alumina substrates. It was demonstrated that the sealing material can be dispersed in aqueous slurries covering a broad range of viscosities to be applicable to the substrates via spraying, painting or dipping. For the conversion of the applied coating material to a gas-tight sealing material, a thermal treatment procedure has been elaborated, which can also be run in large-scale, industrial furnaces, allowing the sealing of large-sized parts. A thermal cycling treatment at 1300 °C for 10 h showed no effect on the microstructure of the sealing, demonstrating the thermal stability of the sealing materials. The next step is to proof the gas-tightness of the coatings under application-relevant conditions.

Contacts
Andreas Nöth, Joachim Vogt
Fraunhofer Institute for Silicate Research ISC,
Center for High Temperature Materials and Design HTL
E-mail: andreas.noeth@isc.fraunhofer.de

Tiberius Josef Vilics
LWK PlasmaCeramic GmbH
E-mail: Vilics@plasmaceramic.de

Fraunhofer ADVANCER

Business office
Susanne Freund
Fraunhofer IKTS
Phone: +49 351 2553 7504
E-mail: susanne.freund@ikts.fraunhofer.de
www.advancer.fraunhofer.de