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Research area: Product aims

Paper, paperboard and board // Technical specialty papers

Key words:

Ceramic, preceramic paper, lightweight construction, kiln furniture

TITLE:**Ceramic lightweight constructions****Background/Problem area**

Ceramic 3D structures are difficult to access with conventional approaches such as injection moulding, compression moulding and extrusion. Producing thin-walled structures is only feasible using extrusion processes which results in a very high effort and high costs. Moreover, it is not possible to realize a non-directional pore system throughout the product. Innovative solutions to produce cheap, complex and high temperature resistant ceramic lightweight constructions are still missing.

Pre-ceramic paper used as semi finished product is a cost-efficient and versatile approach for the construction of ceramic 3D structures. However, at the moment there are no optimized set of compounds and shaping techniques.

Objectives/Research results

The objective of this project is to optimize a set of compounds for the paper recipe and develop new shaping techniques for the manufacturing of ceramic lightweight constructions based on conventional shaping techniques used in paper technology.

The project is articulated into two parts:

1. Optimization of the paper recipe in respect to formability (Papiertechnische Stiftung)
2. Thermal conversion (sintering) (Friedrich-Alexander-Universität of Erlangen-Nürnberg)

In the first stage of the project a paper recipe was developed with focus on the shapeability and convertibility of preceramic papers. In the second stage the up-scaling to pilot plant scale was performed at the PTS pilot plant facilities in Heidenau. Based on those up-scaled paper variants, tests for shapeability and convertibility at industry facilities have been performed. Various paper converters have shown that preceramic papers can be folded, stamped or by other means formed on their machines. Further sintering tests are expected to show that these structures can be successfully converted into ceramics, thus yielding interesting and complex 3D structures.

The next steps are to identify possible applications and application fields and to support the adaption of the technology by different industries.

Application/Economic benefits

The use of pre-ceramic papers as flexible green body before sintering combined with paper converting technologies promises new and easily accessible ceramic lightweight constructions (for example corrugated structures). This new process should deliver a cost reduced way to achieve various ceramic 3D structures that are difficult to access by other ceramic producing processes such as compression moulding, injection moulding and extrusion. Possible application areas could be kiln furniture or filtration units.

The research results will be used by German paper manufacturer and converting plants. Secondly, they will have an impact on the future trend of German SMEs (small or medium-sized enterprises) in the technical ceramic and filter industries. Low cost applications of pre-ceramic based technical ceramics could evolve into a totally new market for German enterprises once the current technical problems such as formability and homogeneity of the semi finished products have been solved in research projects.

Period of time: 01.12.2010 – 30.11.2012

Remarks

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