

Research Institute:

PTS München
Heßstr. 134
80797 München

Head of the research institute:

Dr. A.-B. Kerkhoff

Project leaders:

Christoph Sorg
Tel: 089 / 12146-175
Fax: 089 / 12146-36
E-Mail: christoph.sorg@ptspaper.de

Internet: www.ptspaper.de

Research area: Product Aims

Paper, paperboard and board // Technical specialty papers

Key words:

Ceramic, preceramic paper, filtration, support, membrane

Title: Ceramic filter systems based on pre-ceramic papers**Background/Problem area**

Membrane filter systems (support & membrane) can be made of ceramic or polymer materials. Ceramic filter systems compared to polymer filter systems have different properties and useful advantages regarding:

- a) Higher bio-inertness
- b) longer life cycles
- c) higher temperature resistance
- d) better regeneration

Since polymer filter systems are cheaper they have the greatest market share of low-cost applications in the area of micro-, ultra- and particle filtration.

Ceramic filter structures are limited mostly to tubes, which are produced by extrusion technologies.

Objectives/Research results

The objective of this project is to assess the usability of pre-ceramic papers after sintering in fluid filtration systems, especially the application as filter supports. In cooperation with the Friedrich-Alexander-University of Erlangen (FAU) pre-ceramic papers were developed and thermally converted into ceramic bodies which were tested mainly regarding their porosity, strength and filtration properties.

In the first part of the project, different types of pre-ceramic papers were produced in order to find out the correlations between the paper and the resulting porosities within the ceramic microstructure. In the work package "paper development" aluminium oxide and silicon carbide powders were used as fillers in different particle sizes and particle size distributions in shares of 70 to 80 weight percent. Further different types of cellulose fibres with different fibre geometries were tested. The impact of densifying the papers by calendering was also one focus of the examinations in this work package.

The task of FAU is to find the optimum thermal conversion for each type of paper by testing different temperature-time profiles while sintering.

First results showed an open porosity between 23 - 28 % and an average pore size of 7µm. After optimizing steps the open porosity could be increased up to 40 % and the pore size distribution was about 4-5 µm. Result of the last project meeting was, that preceramic papers after thermal conversion (sintering) have the general potential to be used as a typical filter support for different applications. The functional filter membrane needs to be fixed onto the support within a second extra step.

Application/Economic benefits

The use of pre-ceramic papers as flexible green body before sintering combined with paper converting technologies promises new flat and formed filter structures with great filter areas (for example corrugated structures). This new process should deliver a cost reduced way to achieve new market segments in low cost water filtration. The focus herewith is the application of submerged flat membranes in local waste water treatment plants.

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 membrane and environmental industries. Low cost applications of pre-ceramic based filter systems could evolve into a totally new market for German enterprises once the current technical problems such as porosity and strength has been solved in research projects.

Project period: 01.01.2008 – 31.12.2009

Remarks

The research project IGF 272 ZN is being funded by the German Federal Ministry of Economics and Technology BMWi and performed together with University of Erlangen/Nürnberg, Chair of Glass and Ceramics.