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Research area: Product aims

Paper, paperboard and board // technical speciality papers

Key words:

Colour coating, foamed coatings

TITLE:

Frothing up of cavity structures of coating layers

Background/Problem area

Paper as a documentation and information medium is of global importance. This is due especially to high-quality, coated papers. The high demands on optical properties such as the whiteness and opacity of the graphic papers are accompanied by the trend towards reducing grammage to keep transportation costs as low as possible. Coating paper is the only way to maintain these optical properties whilst simultaneously reducing paper weight. Coated papers must have good printability for classical printing processes (offset or gravure printing) and also for non-impact printing processes of increasing importance such as inkjet or laser printing. At the same time, mechanical properties like paper rigidity or tear propagation work which should be maintained or even improved are of importance for subsequent processes.

The development of voluminous cavity structures containing coating on paper would therefore be an important measure in reducing raw material costs, obtained in the form of a coating with the same coat thickness compared with a standard coated paper, but with a reduced amount of colour applied with little or no effects on downstream processes.

Foam applications are already being used in many other industrial applications. The majority of these applications are using physically generated foams which have some disadvantages like bubble size to be attained or an uneven and wide range of bubble size distribution.

Objectives/Research results

Until today, no reasonable way has been found to apply a thin and at the same time evenly distributed foam, which is characterised by small bubble size.

The target of the research project will therefore be to create very small cavities generated via chemical reaction releasing gaseous products thus causing the formation of said cavities aimed at a low specific gravity of the coating. The project focuses on reducing the specific coat mass, whilst at the same time increasing the opacity and generation of interfaces by numerous very small and evenly distributed small bubbles in the coating.

The variations of foamed coatings to be investigated and used in the application of colour coating of the project are produced either by acidic-base reaction of carbonates or by polyurethane foam production. Protein foams are also of interest as a research objective but will be combined with the chemical reaction of carbonates with acidic components due to the fact that protein foams can only be generated either physically or by the additional use of chemical gas releasing reactions for example as previously mentioned. Several specific questions must be addressed in conjunction with the foam generating process, foam stabilization, application and possible side reactions with the paper surface during application.

In-depth studies into the gas producing reaction of carbonates with acidic salt solutions together with the incorporation of the chemical reaction into the colour formulation process have been conducted giving indications as to how to produce foamed pigment coatings. Furthermore, different coating procedures and coating layer orders have been made and examined by REM and mercury porosimetry. For the polyurethane process, the foam was applied in different thicknesses and formulations including various foaming properties. In addition, several coating techniques were used. Also a semi-continous coating was conducted on a pilot coater.

Finally the processability such as printability or folding stability of the foamed coatings was evaluated.

Application/Economic benefits

An application of foamed colour coatings opens up the possibility of weight reduction with unaltered mechanical properties in various paper and cardboard inserts.

Due to the expected results, different markets may yield benefits in different forms beginning with chemical suppliers, paper producers, and finally with paper or cardboard users. Production costs will be reduced as less material will be used. Chemical suppliers will have an opportunity to launch addition product in the paper producing market. Printing shops will benefit from improved optical performance and at the same time from reduced weight.

Period of time: 01.01.2013 – 31.03.2015

Remarks

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