

Research Institute:

PTS München
Heßstr. 134
80797 München

Internet: www.ptspaper.de

Research area: Process aims

Paper and paperboard production // Surface treatment

Head of the research institute:

Dr. F. Miletzky

Project leader:

Dr. Philip Andres

Tel: 089 / 12146-273

Fax: 089 / 12146-36

E-Mail: philip.andres@ptspaper.de

Key words:

Structure formation, opacity, coverage

Title: Targeted, cost-effective structuring of coating colours with a view to improving opacity and coverage of paper and paperboard**Background/Problem area**

Owing to the constant further development of paper and paperboard, pigment manufacturers are more and more often faced with the task of having to produce modified, customised pigments with optimised property spectra. One way of achieving this goal is to selectively structure the pigments or to use pigments with a steep particle size distribution. Structured pigments known up to now, e.g. calcined kaolin, still suffer from drawbacks regarding their rheological properties, abrasion, or their price so that they have only been used in coating colours to a limited extent. There is a need for new, structured pigments that can be manufactured in a cost-effective way and which meet industry's requirements on opacity and coverage with regard to printing paper and board.

Any agglomerates or aggregates that might have been contained in the coating pigments that are used in papermaking have already been destroyed. The advantages of these pigments are their high solids contents, good rheological properties and uniform paper quality. Their disadvantages, however, include a rather low volume and a low light scattering coefficient, thus lowering opacity and coverage of the papers. The destabilisation of such dispersed systems gives rise to higher-level structures that can change not only the rheological properties of the coating colour, but also the surface properties of the coating itself. Actually, structures are formed within the coating colour that are then transferred to the coating layer during the coating process. An improvement in paper quality can be expected just like the use of structured pigments or pigments with a steeper particle size distribution.

Objectives/Research results

The primary objective of this project is to improve the opacity and coverage of coating paper and paperboard using low-price pigments. This is to be achieved by means of structure formation within the coating colour, thus changing the pore structure of the coating layer. The structure is formed by adding suitable additives directly before or during coating colour manufacture to thus utilise different effects (reducing the thickness of the diffuse layer, reducing the surface charge, the use of flocculants).

It must be borne in mind, however, that an improvement in optical properties must not bring about a resultant deterioration in the other properties of either the coating colour or the paper.

A first step involved screening possible additives and evaluating their effects in lab scale. In the second step the required quantities of the additives were optimised. As third step the optimised recipes were evaluated in a pilot scale trial. It was found that short-chained, cationically charged polymers produce the best effect.

Application/Economic benefits

The aim of the research project is to produce pigment slurries or coating colours by adding small amounts of additives. Such additives are frequently manufactured by small and medium sized enterprises. The results of the research project will show these enterprises how existing products can be improved for structure formation, thus intensifying their own research endeavours and producing new, improved products whilst at the same time expanding their product portfolio. New markets can be tapped or existing markets expanded based on the sales of the structure-imparting additives.

Companies in the paper sector can achieve economic advantages from the results of research. Conventional coating pigments such as kaolin and natural calcium carbonate with a wide particle size distribution are relatively inexpensive. In order to achieve enhanced properties, however, modified pigments often need to be used and this involves higher costs. If such pigments are used, it should be considered whether or not the advantages achieved justify the higher price. The use of more low-priced pigments with structure-imparting additives may well prove to be the more cost-effective alternative.

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Remarks

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