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Research area: product aims

End products made of paper, paperboard and board / other

Key words:

UV curing, paper coating

Title: The use of UV technology for producing paper coatings with functional surfaces

Background/Problem area

Coated paper constitutes a major part of all products produced in the paper industry. Actually, special coating functions are increasingly in demand in order to develop sales markets. New coatings with new properties, however, require modifications in the formulations and even the use of other technologies which are as yet uncommon in the paper sector. UV technology may well be a viable alternative, since conventional coat drying also requires large amounts of energy, since the price of energy continues to rise and even papermakers are demanding environmentally sound and economical production. Radiation technologies, however, are not yet state of the art in the paper sector.

UV technology offers the theoretical possibility of producing new layers on paper with simultaneous process optimisation (30% less energy than conventional coat drying). In order to function well as a printing substrate, however, paper coatings contain pigments in most cases. How pigmented systems can be cross-linked on paper by means of UV radiation has yet to be clarified.

Objectives/Research results

The objective of this project is to study UV technology to determine whether or not it is suitable for functional paper coatings. The study will focus on analysing pigmented coatings, since these play an important role in ensuring printability. Important results achieved until now are:

- The radiation penetrates into the coating colours, also in formulations containing the usual pigments and pigment/binder ratios,
- The UV cross-linking effect depends on the pigment type (shape, size), light sources and technical parameters used,
- Free radical-induced UV cross-linking requires gallium and mercury sources; cationic UV curing only a mercury source,
- For larger pigments (clay) it is necessary to overdose the photo-initiators because they can adsorb on the pigment,
- The cross-linking effect decreases in z-direction of the coating, but the properties tested so far (porosity, elastic modulus) showed good results.
- UV cross-linking of modified polyvinyl alcohol is feasible, but the process has not led to barrier properties so far.
- For common application weights, UV cross-linking appears to be a useful alternative also in combination with pigments, provided that cross-linking speeds are suitably adapted.

Application/Economic benefits

For papermakers, the use of UV technology exploits a number of possibilities for venturing into new market segments with a view not only to developing new products with enhanced properties but also energetically optimised processes. The use of UV technology is expected to improve the waterproofness or mechanical properties of coatings, thus improving the characteristics of such coatings at the same time.

The economical significance of the project arises primarily from the economic importance of coated web-based substrates for the printing industry. Such substrates include not only graphic paper, but also metal foils, coils and strips, plastic films and webs of artificial leather and textiles.

Project period: 1.1.2012 - 30.6.2014

Remarks

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