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Research area: Process aims

Paper and paperboard production // Surface treatment

Key words:

Coating colour, printing, electronics

Title:

Fine tuning of paper, printing ink and printing processes for manufacturing electronic units and integrated circuits based on (semi) conductive polymers on optimized coated paper as commodity products

Background/Problem area

Distinct types of polymers allow for a transport of charge along their polymeric chains and can be used to manufacture conductive and semi conductive structures. A rapid development has led to first industrial applications in the area of displays and for a short time, a number of materials is available for electronic applications based on conductive polymers.

Classic technologies like web offset printing and / or rotogravure printing have proven to be most promising in terms of resolution and production speed to realize polymeric structures with sufficient precision. Extensive preliminary investigations using coated papers as substrates indicate that the obtained quality varies with the paper grade in use. Existing problems like short life times (due to diffusion), little developed production technology (state of development is comparable to micro electronics in the 50s), work cycles 1-10 kHz, increasing and power requirement are only to be solved in an interdisciplinary approach.

This interdisciplinary collaboration is realized in this project, where the printing industries, represented by IPM, and the paper industry, represented by PTS, are closely cooperating. The cooperation with Wuppertal University, where appropriate polymers are being developed as a basic component of the printing ink used at IPM completes the required expertise.

Objectives/Research results

Polymer electronic units and integrated circuits on paper as commodity products will be manufactured in this project with all consequences for the pricing of such products. Reaching this objective requires a printing ink which meets the requirements of electronic behaviour as well as the requirements of the printing process. Printing ink and substrate need to be adjusted and fine tuned in an adjusted printing process in order to reach the necessary quality.

Substrate: PTS has the task to develop and provide a coated paper which is capable to serve as a cost-effective substrate for printing valuable electronic structures based on polymers.

Printing ink: The institute for polymer technology will develop and provide the required semi conducting polymers meeting the requirements from the printing process

Printing process: IPM has the task to test the suitability of the developed papers and the polymers, formulated to printing inks, in adapted printing processes, basically rotogravure, and offset processes, if necessary also flexo or other new printing processes. The results will be used to define the requirements for substrate and polymers.

A number of pilot trials have raised the obtainable quality significantly above today's standards with paper on the market.

Application/Economic benefits

Research results will be used predominantly by the chemical industry dealing with the production of polymers for such purposes. Aside, a part of the paper industry - due to the required amounts of paper it will mainly be the producers of speciality papers which usually are smaller enterprises - will be interested in transferring the results into their industrial praxis. Finally, enterprises from the printing industry will use the results to print electronic structures on paper on their machines.

Possible lot sizes, which are enabled by printing polymeric units on paper will be extremely high for the electronic industry, for the paper producing and printing industry however, these products will only affect a very limited market. The generated knowledge therefore will be used predominantly by small and medium sized enterprises of these industry branches to supply appropriate products. Especially these SMEs with small R&D divisions will profit from the interdisciplinary cooperation which they cannot organize so easily.

Entering a high tech market provides a competitive advantage for these enterprises and can provide the fundamentals for the safety of jobs and promote job creation in the branches.

Project period: 01.02.2006 – 31.01.2008

Remarks

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