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Research area: Product aims

Paper, paperboard and board // Packaging papers and paperboard

Key words:

Hydrogel, paper coating, self-climatizing packaging, humidity adjustment

TITLE:**Self-climatizing Packaging based on Paper Coating containing Hydrogels****Background/Problem area**

Besides being decoration, packaging mainly serves to protect products. To achieve this, several concepts such as water or oxygen barrier systems to avoid deterioration of commodities are pursued. In addition, some products have to be stored at especially adjustable humidity in order to preserve their optimal practical value. Actual demands of the market prove clear needs to adjust the air moisture in packaging and to be able to maintain it constant regardless of external conditions like temperature or humidity fluctuations. Today, autonomously working systems which meet these requirements are not known yet, which opens a need for research having a wide spectrum of application possibilities. Hydrogels are able to absorb and release water due to their hydrophilic polymer network structure. Once being made an active paper coating component, hydrogels offer the theoretical possibility of adjusting the humidity in packaging. Hydrogels can absorb liquids up to a hundred times their own weight, which makes them an indispensable auxiliary material for sanitary products with the further ability not to release the absorbed liquids under pressure.

Objectives/Research results

The aim of this project is to develop packaging material which offers the possibility of binding water in such a way that it will be released / absorbed at low / high internal moisture, thus providing a humidity self-regulating packaging.

In this project folding boxboard will be modified by a coating which contains hydrogels as active components. Besides the development of the coating formulations, the project comprises measurements of thermodynamic parameters of hydrogels concerning the absorption and the release of water (e.g. swelling degree, sorption kinetics). Hydrogels with and without a lower critical solution temperature (LCST) have been studied. Hydrogels with LCST (under which a phase transition and release of the expanding agent takes place) are thermosensitive.

Important results achieved until now as a function of temperature and relative humidity are:

- Study of swelling behaviour of different commercial hydrogels without LCST in water and air,
- Determination of the swelling degree in water and air,
- Study of the swelling and de-swelling behaviour in varying climatic conditions,
- Influence of hydrogel particle size on swelling degree,
- Reproducibility tests and swelling kinetics,
- Development of hydrogel containing coatings on folding boxboard samples with and without additional hygroscopic components,
- Evaluation of the coating (surface) properties,
- Proof of concept of reversible water vapour sorption under different climatic conditions,
- Quantitative evaluation regarding the water sorption capacity of different hydrogel coatings and comparison of sorption kinetics,
- Application-specific tests of the functionalized paper board samples concerning their processing properties.

Application/Economic benefits

As a result of this research project specifications will be formulated for improved package surfaces enabling humidity self-regulating properties. These changes should lead to new possibilities in packaging as well as to more versatile and innovative applications of packaging.

Until now it has not been possible to regulate selectively the moisture content inside the packaging which leads to the assumption that this project will arouse great market interest.

The project results can be expected to benefit mainly small and medium sized enterprises in the packaging industry.

Period of time: 01.09.2013 - 31.08.2015

Remarks

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