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**Research area: Product aims**

Paper, paperboard and board // packaging papers and paperboard

**Key words:**

Migration, Phthalates, Food Contact Materials made of paper and board, legal requirements

**TITLE:****Reduction of the migration of phthalates from packaging materials made of recycled board into food****Background/Problem area**

Phthalates are critical substances, which are ubiquitous present in the environment and daily life products. Many of them are known to cause serious health effects on humans. Therefore many regulations and restrictions are defined in chemical, environment and food law. It is supposed to get even more phthalates restrictions in the near future.

Migration from paper and board food contact materials made of recycled paper is a concern for food safety. To respect legal requirements such as good manufacturing practice, paper and board manufacturers and producers have to know their relevant contaminant sources and actions to reduce migration which could endanger human health or bring about an unacceptable change in the composition of the food. Beside mineral oil phthalates are one of the most abundant contamination known to migrate from recycled paper and board into packed food. Sources for certain phthalates may be raw materials, chemical additives, production aids, printing inks, varnishes or adhesives.

Options to reduce the migration of phthalates are firstly careful selection of raw materials by using only unprinted, non-glued and/or virgin fibres. Secondly a reduction within the processing of paper and board may be an option. By heating or washing steps the content of volatile phthalates could be reduced to a certain extent. The third option is the use of functional barriers on the board or additional inner packaging, which is not attractive due to high costs and additional machinery.

**Objectives/Research results**

The objective of this project is the reduction of phthalate migration from packaging materials made of recycled board into food based on identification of all sources and quantification of phthalate input streams as well as of the phthalate migration. After successful implementation of the analytics of phthalates for many different matrices (paper and board, water, additives) in order to identify additional origins of phthalates beside already known sources such as dispersion adhesives and such as impurities of additives and production aids first paper and board samples were taken in a paper mill and in a paper converting company. For the amount of additives, printing inks and adhesives and processing aids a screening method using GC-MS was developed to determine the impact of these excipients to the packaging material. In these samples DIBP, DBP, DEHP and BBP were detected. Especially BBP was found in almost every printing ink at low concentration levels between 10 and 20 µg/kg sample. Plastic containers of sampled additives were examined by ATR-IR and the results showed that they are a nonrelevant source for phthalate contamination. Apart from already known migrating phthalates (Diisobutylphthalate, Dibutylphthalate, Di(ethyl-hexyl)phthalate) the content of further phthalates and their abundance in raw materials and production aids were checked. Therefore the whole production chain and material throughput starting from raw materials, water circulation, chemical additives and production aids up to the final paper and board products were sampled and analysed by GC-MS. Phthalates are identified in almost every sample, but a wide range of concentration levels was observed. The analysis of phthalates in packaging materials from recycled fibres sold on the German market showed that DIBP, DBP, DEHP and BBP are the most abundant phthalate compounds. Other phthalates like DOP or the high molecular DINP and DPHP were found in several paper and board samples. DEHP levels varied between 2 and 12 mg/kg, BBP between not detected and 0,5 mg/kg board. The most significant differences were observed for DIBP and DBP. Especially DIBP varied between 1 and 30 mg/kg board. The migration potential of high and low contaminated paper and board products for food contact was tested with food simulants Tenax® and Ethanol (50 % (v/v)). Especially DIBP, as a volatile and low molecular substance, again demonstrated to be a critical migrant for food packaged in paper and board of recycled fibres. It could exceed the special migration limit of 0,3 mg/kg food for DIBP resp. sum of DBP+DiBP). After identifying the relevant migrating phthalates the possibility of reducing their content within the production process (waste water, deinking, heating...) and a mass balance within the value chain could be estimated. The main sources as well as possibilities for action will be reported.

**Application/Economic benefits**

This study aims to deliver an overview on the phthalate occurrence in material streams of paper mills and paper manufacturers with the intention of reducing the phthalates within the paper making process. This investment yields food contact materials with low phthalate content. Knowing the phthalate sources and possibilities of reduction yields paper and board products with low phthalate contents, which respect to nowadays and future legislative requirements. These products of high quality are supposed to be effective in advertising and thus provide an economic advantage on the P&B market.

**Period of time:** 01.01.2014 – 31.12.2015

**Remarks**

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