

## **Thermal properties of cellulose acetate blends with thermoplastic urethanes and plasticizers**

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The use of bio-based polymers in technical products or in general becomes more and more important, due to the change in society towards more ecological thinking. Cellulose acetate (CA) is based on its thermal and mechanical characteristics in comparison with other bio-based polymers more suitable for long-life and durable applications.

Thermoplastic CA exhibits outstanding properties as a high transparency and good mechanical properties which make it comparable with petrochemical based polymers like polystyrene (PS) and acrylonitril-butadiene-styrol copolymer (ABS) that are mainly used for technical applications. The main drawback why CA is currently not used for this kind of use is its poor resistance against impact. Therefore, we investigated CA blending with thermoplastic urethane (TPU) to promote toughness of the material.

The poster will show the thermal properties of the plasticized CA as well as the plasticized CA blended with thermoplastic urethane as toughening agent. Three different eco-friendly plasticizers (citrate and acetate based) in different concentrations were used to investigate their influence on the thermal properties of CA. Furthermore, combinations between the plasticized CA and the TPU were analyzed using differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). The plasticizer efficiency, which is visible in a strong decrease of the glass transition temperature  $T_g$ , is linked with the plasticizer concentration as well as the miscibility between plasticizer type and CA.

In general, with increasing plasticizer concentration the glass transition temperature  $T_g$  of the plasticized CA decreases constantly. This significantly improves the processibility and simultaneously increases the processing window of CA. Plasticizers with solubility parameters close to those of CA showed a better plastication efficiency as the other ones. As a consequence, the thermal properties of CA can not only be adjusted by the amount of plasticizer but also by using a more effective plasticizer (more compatible plasticizer) at constant concentration. A further parameter for adjusting the glass transition temperature is the content of TPU in the blend which will also be shown.