UV CURABLE MATERIALS FROM TAILORED LIGNIN (METH)ACRYLATES

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Lignin, the second most abundant bio-based polymer is until today an underutilized and cheap low-value waste product from paper and pulp industry, which is available in huge quantity and is mainly used for combustion. Due to the increasing concern of depletion of fossil fuels, lignin is a promising candidate of the group of renewable bio-based polymers to produce composites and polymers from natural resources or is even considered for petroleum-based materials in the future.

Lignin is already used as active filler in some biodegradable polymers to improve material properties such as hydrophobicity, stiffness and crystallinity.[1] However, the unmodified lignin has especially poor solubility properties due to irregular structure based on substituted phenyl rings, phenolic and aliphatic hydroxyl groups that support the self-aggregation. The liquefaction of lignin by reaction with propylene oxide helps to overcome the poor dispersion quality, homogenize the different functional groups and increases the reactivity.

In this work, wheat straw soda lignin (A) was oxyalkylated with propylene oxide and the average length of the grafted polymer chains was estimated via ^{1}H-NMR and the hydroxyl number was determined by ^{31}P-NMR spectroscopy. Further, the oxyalkylated lignin (B) was reacted with photopolymerizable (meth)acrylate groups and processed by lithography-based additive manufacturing to obtain arbitrary parts (C) in high resolution.

A B C

[1] M. N. S. Kumar et al, Lignin and its applications with polymers, *J. Biobased Mater. Bioenergy* **2009**, *3*, 1–24.