

Hydroxymethylfurfural: production and application in binder-systems

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For the production of wood-based materials, such as particleboards, 4-12% fossil-based binder is needed. Mainly formaldehyde-based condensation resins are used. Since fossil-based resources have a high carbon footprint, an alternative binder from renewable resources that can compete at industrial scale is favorable. Carbohydrates are a promising feedstock for the production of bio-based resins. For a technical usability, the used crosslinkers for the production of the binder must meet various criteria from a chemical and application perspective. The acid dehydration of carbohydrates leads to valuable platform chemicals. One very promising novel platform chemical is hydroxymethylfurfural (HMF). [1]

To get an overview of existing process technologies for the carbohydrate conversion to chemical building blocks that can be used for the production of binders, e.g. HMF, a literature research was conducted. This literature research focusses on small-scale production methods of HMF and the utilization of HMF and its derivatives in the production of bio-based binder systems.

Several processing technologies are described in patent literature. With regard to green chemistry production, the carbohydrate dehydration to HMF faces some challenges. Due to the formation of side products, e.g. formic acid, levulinic acid and humins, the yield of HMF is relatively low in aqueous solutions. Hydroxymethylfurfural can be further converted to secondary building blocks. [1] The utilization of HMF and its derivatives in the production of bio-based binders has been reported in literature. [2]

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[1] VAN PUTTEN, R.-J. et al, 2013. Hydroxymethylfurfural, A Versatile Platform Chemical Made from Renewable Resources. *Chemical Reviews*, 113, 1499-1597.

[2] ZHANG, Y., NANDA, M., TYMCHYSHYN, M., YUAN, Z. & XU, C. 2015. *Mechanical, thermal, and curing characteristics of renewable phenol-hydroxymethylfurfural resin for application in bio-composites.*