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Development and Application of Accessory Hemicellulases for the Production of new Xylan Based Polymers.

Several of hemicellulose polysaccharides have been shown to have interesting properties and are promising as cheap and green constituents in films, hydrogels, food additives and emulsifiers, binders in paper making, and bio-based fuels. The hemicellulose chains have hydroxyl groups in each repeating unit that can react with chemical or enzymatic catalysts that introduce new functional groups and possibly new properties. The modification potential is universal for all polysaccharides and is a contributing factor to the rapidly growing interest of polysaccharides as renewable materials. Biodegradability and nontoxity are also important features of the polysaccharides in this respect. Xylan is a component of the hemicellulose in the plant cell wall and represents a major source of polysaccharides with increasing application opportunities.

Polysaccharides are typically associated with an enzymatically mediated modification and offer a source of attractive materials in various biological settings, typically in foods, in the biomedical or the agricultural field or as packaging material. During the past years a broad spectrum of hemicellulases activities and molecular structures have been elucidated, which facilitates the design of novel hemicellulases with improved and tailored performance.

The aim of the current research project is to harness the specificity of enzymes to increase the homogeneity of complex hemicellulose fractions while retaining the degree of polymerization of the isolated biopolymer. In this way, hemicellulose building-blocks will be generated that are suitable for co-polymerization through aqueous chemistry (e.g. click chemistry). The result of this research will be a new chemo-enzymatic approach to synthesize novel biomaterial architectures and properties from forest and agricultural biomass.