

MWP – Young Researcher Abstract 2024

Project title: Improving hemicellulose and lignin quality in biomass fractionation to facilitate downstream valorization	
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Abstract (approx. 200 words): <p>Hemicellulose and lignin are abundant constituents of lignocellulosic biomass but are often undervalued due to the severe degradation in conventional pulping processes. The degraded feedstocks limit their applications despite the increasing attention that non-edible sugars and lignin draw in material and chemical production. My research aims to develop novel fractionation routes that not only reduce the degradation of these components but also enable their direct functionalization. One part of my work focuses on producing diformylxylose (DFX), a hemicellulose-derived solvent and platform chemical, via aldehyde-assisted fractionation of corncobs, co-producing cellulose and aldehyde-protected lignin. DFX can be efficiently converted to drop-in chemicals, like xylitol and furfural. In another project, I significantly reduced lignin condensation in pulping conditions by introducing a protection reagent in the cooking liquor. The preserved lignin native structures may unlock new applications. Due to the industry-oriented nature of my research, I iteratively combined experimental work, process simulations, techno-economic assessments, and life-cycle analyses to render these processes economically competitive and life-cycle impacts. By providing the industry with high-quality, low-cost and sustainable feedstocks, I hope to lower the environmental impact of our daily activities.</p>	
Key words: Biomass fractionation, lignin, hemicellulose, protecting groups, chemical pulping	