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Bio-oil refineries: Challenges and opportunities

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Biomass derived pyrolysis oils are complex mixtures of hundreds of compounds. These oils typically contain water (19-26 wt.%), GC/MS detectable volatile compounds (30 wt.%), lignin derived oligomers (15-23 wt.%) and water soluble (WS) compounds (28-36 wt.%). The nature of the WS oligomers is still poorly known. In this presentation, we will discuss two strategies to describe the bio-oil composition in terms that can be used for engineering design. The first approach is formalization of the bio-oils' composition in terms of functional groups; the second describes bio-oils' composition in families based on their volatility behavior in thermogravimetric analyses. The chemical composition of the WS fraction is described in detail. Our FT-ICR-MS and UV-Fluorescence studies allowed us to identify the presence of two new fractions: dehydrated sugars and WS oligomeric phenols. Here we will discuss the advances made by our group on the evaluation of bio-oil new separation schemes and on the development of new products from bio-oil fractions. The combination of these separation schemes with technologies to obtain high value products is foundation for the synthesis of new bio-refinery concepts. We will address several potential bio-refinery concepts, their challenges and opportunities.

Biography

Manuel Garcia-Perez is an Associate Professor for the Biological Systems Engineering Department at Washington State University. He has been working for the last 15 years on projects related with the thermochemical conversion of lignocellulosic materials for the production of bio-fuels and chemicals. So far he has published more than 110 peer reviewed papers. He has made contributions to the understanding of thermochemical reactions of cellulose and lignin as well as the characterization and uses of crude bio-oils. He is currently working on the development of more selective pyrolysis reactors and on new concepts to refine pyrolysis oils. He is also very active on the development and characterization of engineering carbonaceous materials.

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