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Sustainability through catalysis: Making biofuels and chemicals from biomass

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Transition metal catalysts have been an integral part of the success story of the petrochemical industry in the past century. Two grand challenges for this century are renewable energy and the utilization of green resources. Approximately 1.4 billion tons of lingo-cellulosic biomass is an annually renewable source of energy and feedstock in the U.S. alone. The major components of biomass are cellulose, hemi-cellulose/xylan, and lignin. All are polymeric and contain high percentage of oxygen. Current biomass utilization processes do not make use of lignin beyond its heat value. We have developed selective catalysts that convert lignin in intact wood biomass directly into two methoxyphenol chemicals, DHE and DMPP, leaving behind the carbohydrates as a solid residue. The lignin-derived methoxyphenols can be deoxygenated further to hydrocarbon fuels. Furthermore, the carbohydrate solid residue can be hydrolyzed and converted to fuels and chemicals via simple cascade catalytic reactions. Based on these results, a synergistic biorefinery is proposed in which both the lignin and carbohydrate fractions are utilized to make fuels and chemicals.

Biography

Mahdi M Abu-Omar completed his PhD from Iowa State University and Post-doctorate from Caltech. He is the R. B. Wetherill Professor of Chemistry at Purdue University, and the Associate Director of the Center for Catalytic Conversion of Biomass to Biofuels (C3Bio), an Energy Frontiers Research Center. He is the Founder and President of Spero Energy, Inc., a green specialty chemicals company and a technology provider for the manufacture of high value renewable chemicals from biomass.He has published more than 100 original research papers inpeer-reviewed journals. He is a Fellow of the American Association for Advancement of Science (AAAS).

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