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Char and Methanol Synthesis by the Destructive Distillation of Cellulosic Waste - Environmental Implications

The feasibility of using the products from the destructive distillation of biomass as a source of liquid biofuel and fertilizer was examined. The analysis consisted of examining the energy balance and scalability of the distillation, and the effect of the residual products on the growth of plants. The destructive distillation of varying masses of wood splints indicated that as the mass of the splints increased, the total energy transferred into the system per gram of reactant to complete the distillation decreased from 95.3 kJ/g for a 0.51g sample to 14.5 kJ/g for a 10.01 g sample. The percent yield of char did not change significantly as the mass of the reactants increased, averaging 25.4 % ± 3.21% for all distillations. The effect of the char and residual solution from the distillation on the growth of plants were observed by planting both mungbean and gourd plants in four different environments: sterile topsoil + tap water, char-topsoil + tap water, topsoil + distillation solution, and char-topsoil + solution. For the mungbeans, sprouts grown in the char + water and topsoil + solution environments tended to develop longer sprouts. Additionally, those grown in the topsoil + solution developed longer leaves than those grown in other environments. For the gourds, those grown in the control group developed, on average, significantly shorter stems and leaves. These results indicate that the destructive distillation process may be scaled to a larger, but still localized scale, as a potentially energy-efficient means of extracting a liquid fuel and fertilizer from otherwise unwanted waste products.