

## **Purity and structural composition of lignin isolated from *Miscanthus x giganteus* by sub-critical water extraction with associated modifiers**

### **ABSTRACT**

Lignin is an industrial by-product produced from the pulping and paper industry, where the process generates lignin in the form of lignosulphonates. While there are many applications for lignin, there are all low value and attempts to add value to lignin are hindered by its complex physicochemical nature and the presence of sulphur. Adopting the biorefining concept, the study evaluates the impact of direct (DE) and sequential extraction (SE) of *Miscanthus x giganteus* using sub-critical water with associated modifiers; ethanol and carbon dioxide on the physical and chemical properties of the extracted lignin. Isolated lignins were characterised by a Fourier Transform Infrared Spectroscopy (FTIR). Although higher delignification was achieved by DE and SE about 81.5% and 58.0%, respectively, the lignin recovered from the SE process showed remarkably higher purity with 91.5%. Lignin recovery did not differ considerably for either processing method. FTIR revealed a qualitative reduction in the intensity of bonds corresponding to hydroxyl groups for the lignin derived from DE rather than SE processing routes. These indicated that the lignin derived from SE had potential for subsequent preparation in lignin value-added bio-based materials.

**Keyword:** *Miscanthus*; Lignocellulosic biomass; Lignin; Sub-critical water; Modified organosolv