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Extraction of phenols from lignin microwave-pyrolysis oil using a switchable hydrophilicity solvent

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Abstract. Microwave pyrolysis of lignin, an aromatic polymer byproduct from paper-pulping industry, produces char, gases, and lignin pyrolysis oil. Within the oil are valuable phenolic compounds such as phenol, guaiacol and catechol. In this work, we describe a method using switchable hydrophilicity solvents (SHS) to extract phenols as a mixture from lignin microwave-pyrolysis oil at the scale of 10 grams of bio-oil. Even at this small scale, losses are small; 96% of the bio-oil was recovered in its three fractions, 72% of guaiacol and 70% of 4-methylguaiacol, the most abundant phenols in the bio-oil, were extracted and 91% of the solvent SHS was recovered after extraction. The starting material (lignin microwave-pyrolysis oil) and the three fractions resulted from SHS extraction were characterized by GC-MS and quantitative $^{13}C\{^{1}H\}$ and $^{31}P\{^{1}H\}$ NMR spectroscopy.

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