At first glance, compared to the coffee cup samples, paper plate specimens seemed to remain mostly intact for the duration of the incubation. However, after thermochemolysis of the paper plate samples an increase in the average lignin yield from an initial value of 0.71 to 8.93 µg/mg sample dry weight (dw) by the end of four weeks was detected. As hypothesized, this increase in lignin detection with time was due to the selective degradation of the more labile polysaccharide components and concomitant concentration of lignin. These results were corroborated by prior FTIR analysis of the same samples which illustrated a decrease in designated polysaccharide peaks at 1158 cm⁻¹ (C1) and 898 cm⁻¹ (C2). At 1505 cm⁻¹ the reference lignin peak (L) also begins to emerge after the third week of anaerobic incubation. In contrast, the initial lignin yield of 0.41 (µg/mg dw) for untreated paper coffee cups was significantly reduced to an average value of 0.13 (µg/mg dw) by the end of the four week anaerobic incubation. Our preliminary results illustrate the usefulness of this approach to tracking the rate and state of degradation of paper based products. However, this thermochemolytic approach can also be applied to naturally occurring materials such as yard trimmings and wood which comprise another 21% of municipal solid waste in landfills. Combined with paper based products, thermochemolysis can facilitate characterization of almost 50% of the materials in our landfills.

Our lab is focused on anaerobic decomposition of wood and paper in landfills. Components of these materials decompose to form greenhouse gases, CO₂ and CH₄ and represent potential carbon sources. In contrast, their more recalcitrant components represent a carbon sink. Accurately characterizing and quantifying the rate and extent of plant and paper biodegradability in landfill soils will significantly impact our assessment of landfill greenhouse inventories and the potential use of landfills as a sink for carbon.

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