

## **Enabling Lignin Valorization with Liquid Liquid Chromatography**

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This project will scale Liquid Liquid Chromatography for the separation and purification of lignin monomers and dimers from lignin oil derived from Lignolix's proprietary Reductive Catalytic Fractionation (RCF) process. Lignolix will sell the purified monomers and dimers as "green" commodity tackifier products to replace petrochemical incumbents. The recovery of lignin products from lignin rich RCF oils is notoriously difficult because they are chemically complex, viscous, contain fine particles, and have broad non-normal molecular weight distributions. Accordingly, these streams are not well suited for separation with traditional Simulated Moving Bed (SMB) chromatography because the high molecular weight compounds lead to rapid fouling of the resin stationary phase. It should also be noted that the target products from these streams cannot be recovered with distillation due to the thermal instability of the solution. Counter Current Chromatography (CCC) is a form of liquid liquid chromatography that is a scalable and uses the counter current motion of a two-phase liquid-liquid system to generate a chromatographic effect on the solvated compounds, separating them into pure components. Accordingly, CCC could represent a paradigm shift in lignin valorization through scaling and deployment in this project, as it represents a single step separations technology for these traditionally difficult to process streams due to its high throughput, ability to handle solids, viscous solutions, and low energy consumption. This project will develop the needed chromatography methods, solvent recycling, CCC validation, TEA /LCA or the separations process, and finally equipment purchasing and installation at Lignolix's facility.