

**Two-step separation of lignin from poplar wood powder by malic  
acid/choline chloride deep eutectic solvents**

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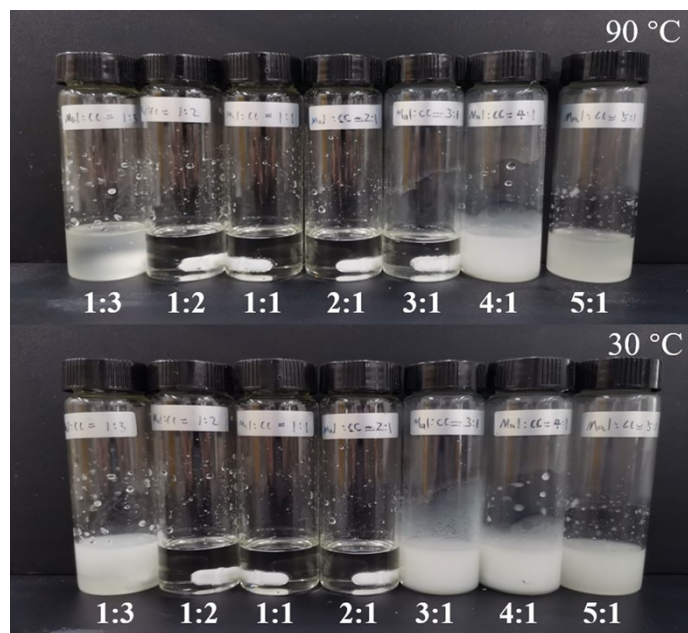
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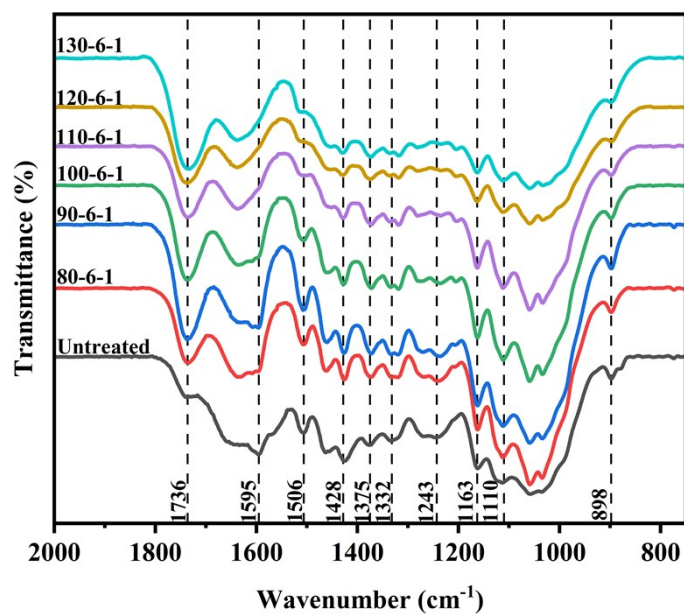
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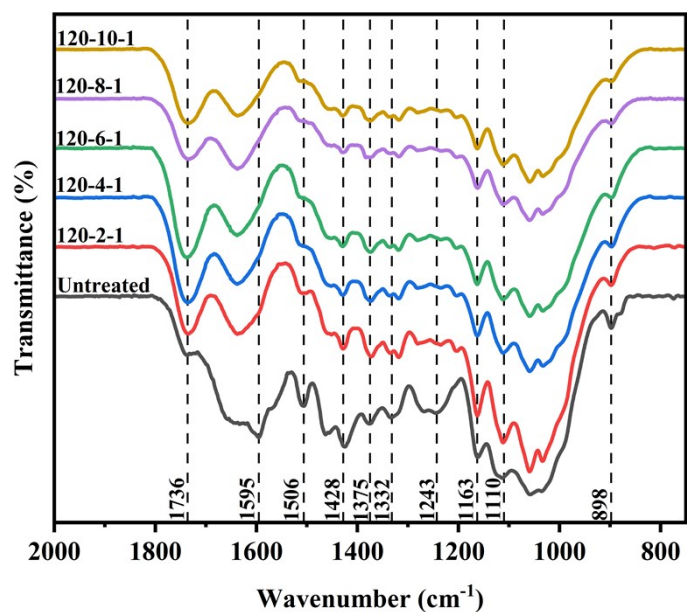
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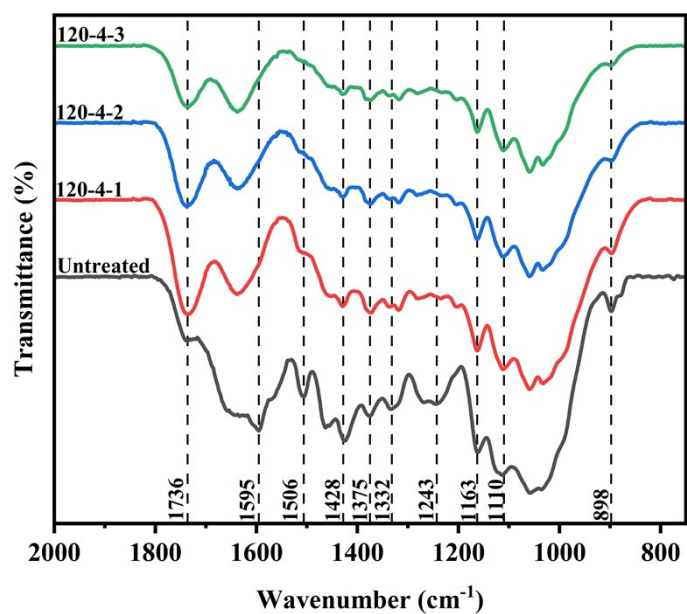
**Figure S1.** Photographs of different molar ratios of Mal/ChCl (anhydrous) at synthesis temperature (90 °C) and at room temperature (30 °C).



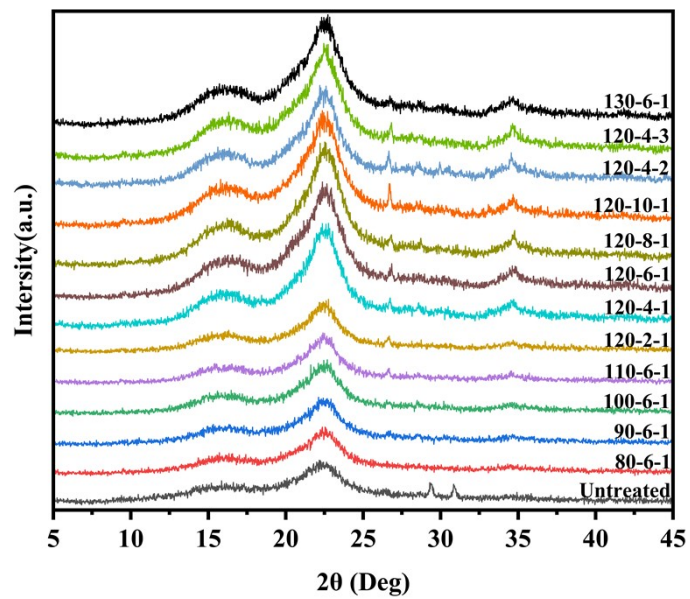
**Figure S2.** FT-IR spectra of SR samples after one-step DESs treatment under different temperature (Mal/ChCl, 6 h).



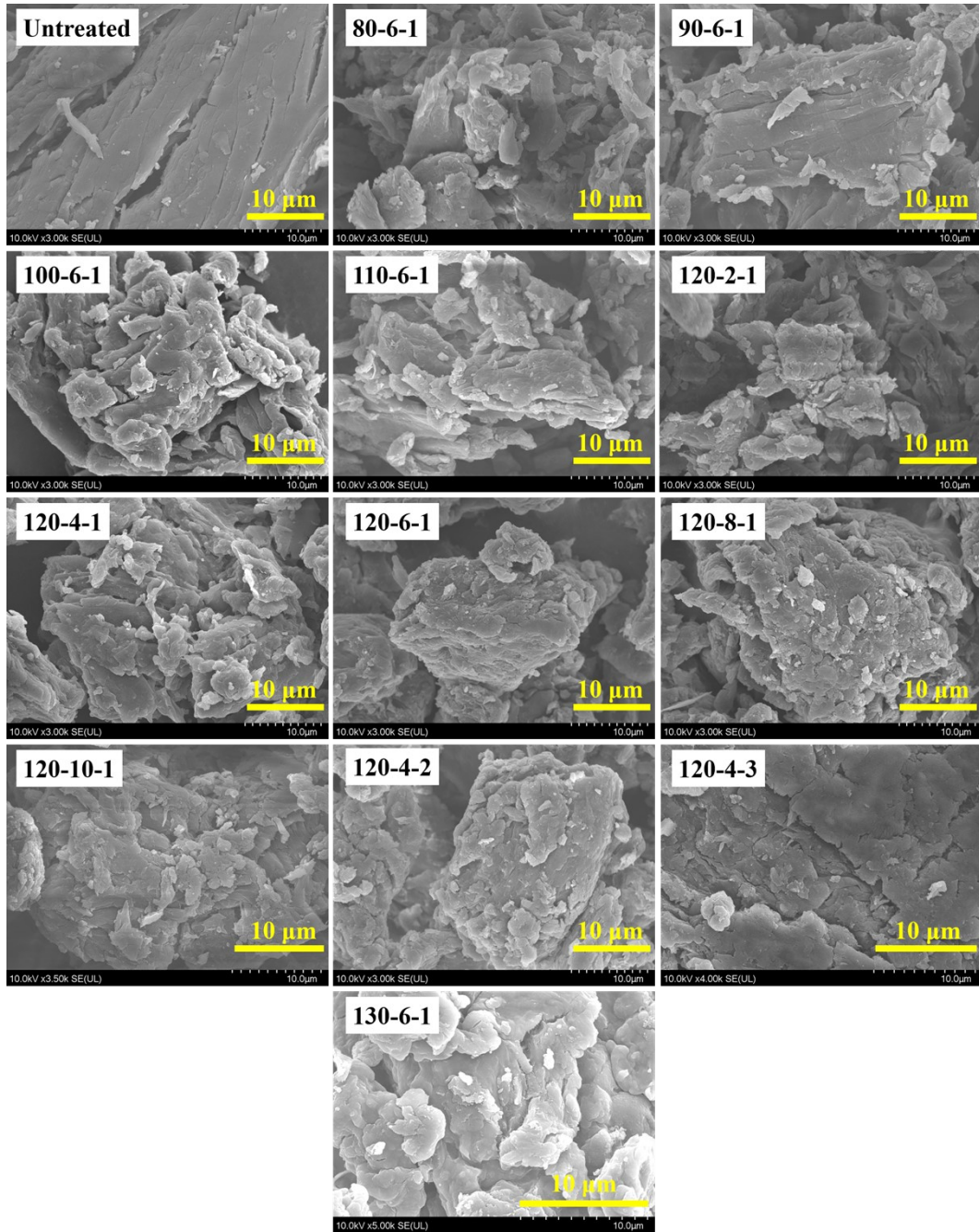
**Figure S3.** FT-IR spectra of SR samples after one-step DESs treatment under different time (Mal/ChCl, 120 °C).



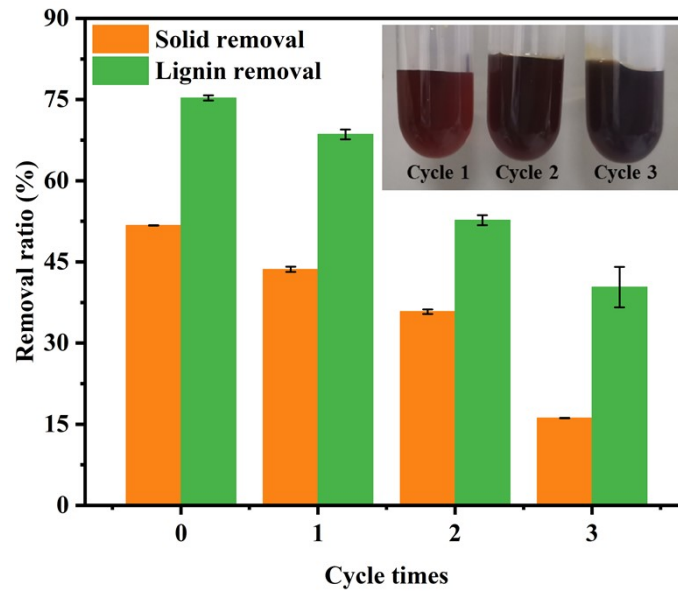
**Figure S4.** FT-IR spectra of SR samples after multiple DESs treatments (Mal/ChCl, 120 °C, 4 h).



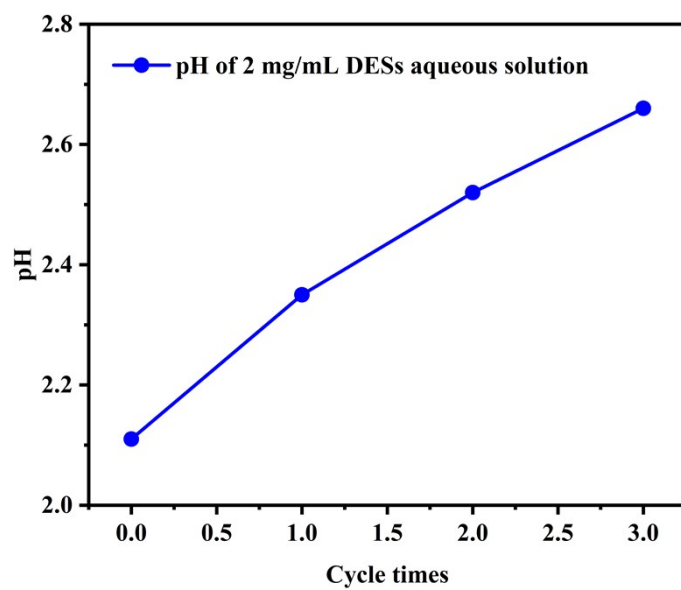
**Figure S5.** X-ray diffraction pattern of biomass samples before and after DES treatment.



**Figure S6.** SEM images of biomass samples before and after DES treatment.



**Figure S7.** Photographs and removal ratio of solid and lignin under different treatment cycles.



**Figure S8.** The pH values of 2 mg/mL aqueous solution under different treatment cycles.