Electronic Supplementary Information

Valorisation of Waste to Yield Recyclable Composites of Elemental Sulfur and Lignin

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Fig. S1 \(^1\text{H}\) NMR Spectrum of allyl lignin.

Fig. S2 FTIR spectra of reference (blue color) and allyl lignin (red color)
**Fig. S3** IR Spectra of composites materials $\text{LS}_{80}$ (blue solid line), $\text{LS}_{85}$ (purple dashed line), $\text{LS}_{90}$ (orange dashed line), $\text{LS}_{95}$ (black solid line), $\text{LS}_{99}$ (red dashed line), sulfur (green solid line)

**Fig. S4** TGA curves of prepared composite materials. Allyl lignin (yellow dashed line, $\text{LS}_{80}$ (blue solid line), sulfur (green solid line)
Fig. S5 The graph showing residue percentage remaining after heating to 800 °C in TGA experiments versus the weight percent of lignin in monomer feed.

Fig. S6 a) DSC curves of LS$_{80}$ (blue solid line), LS$_{85}$ (purple dashed line), LS$_{90}$ (orange dashed line), LS$_{95}$ (black solid line), LS$_{99}$ (red dashed line), sulfur (green solid line) b) enlarged view of DSC curves of LS$_{80}$ (blue solid line) and LS$_{85}$ (purple dashed line) showing $T_g$ and cold crystallization peaks.
Fig. S7 DSC data for allyl lignin (red line) and reference lignin (blue line). The $T_g$ values are marked for clarity.
Fig. S8 DGA curves for data presented in Figure 3 of the manuscript