Supporting information

Fully biodegradable modification of wood for improvement of dimensional stability and water absorption properties by poly(ε-caprolactone) grafting into the cell walls

**Mahmut A. Ermeydan,abc Etienne Cabane,ab Philipp Hass,ab Joachim Koetz**d and **Ingo Burgert**ab*

---

*a* ETH Zurich, Institute for Building Materials, Zurich, Switzerland.

*b* Empa - Swiss Federal Laboratories for Material Testing and Research, Applied Wood Research Laboratory, Dübendorf, Switzerland.

*c* Max Planck Institute of Colloids and Interfaces, Department of Biomaterials, Potsdam, Germany.

*d* University of Potsdam, Institute of Chemistry, Potsdam, Germany.
Supporting information Figure S1. On the left side: Fifteen (10x10x5 mm) wood cubes for each set which were cut perpendicular to the same longitudinal axis and categorized as shown. On the right side: Schematic representation of reaction flow. W-g-PCL(D) (ring opening polymerization of ε-caprolactone in DMF), W-g-PCL(T) (ring opening polymerization of ε-caprolactone in Toluene), Control (DMF) (Control reaction of wood with DMF and initiator).

Equations for swelling coefficient (S), anti-swelling efficiency (ASE), and water uptake (WU):

\[
S(\%) = \left( \frac{V_f - V_{ii}}{V_{ii}} \right) \times 100
\]

where \( S(\%) \): volumetric swelling; \( V_f \): wood volume after wetting with liquid water; \( V_{ii} \): wood volume of oven-dried samples before wetting

\[
ASE(\%) = \left( \frac{S_{um} - S_m}{S_{um}} \right) \times 100
\]

where \( ASE(\%) \): antishrinking/antiswelling efficiency result from the modification; \( S_m \): modified volumetric swelling coefficient; \( S_{um} \): unmodified volumetric swelling coefficient.

\[
WU(\%) = \left( \frac{w_{ii} - w_i}{w_i} \right) \times 100
\]

where \( WU(\%) \): percentage of water uptake of the samples; \( w_i \): initial weight of the sample; \( w_{ii} \): wet weight of the sample after water-soaking

Supporting information Figure S2.

Equation for equilibrium moisture content (EMC):

\[
EMC(\%) = \left( \frac{m - m_{od}}{m_{od}} \right) \times 100
\]

where \( EMC(\%) \): the moisture content; \( m \): the mass of the wood (with moisture) and \( m_{od} \): the oven-dry mass of the wood (i.e. no moisture)

Supporting information Figure S3.
Supporting information Figure S4. EDX analysis of the W-g-PCL(D) demonstrates the existence of Tin(Sn) inside the wood cell walls.