Supporting information for

Studies on swelling of wood with water and ionic liquids

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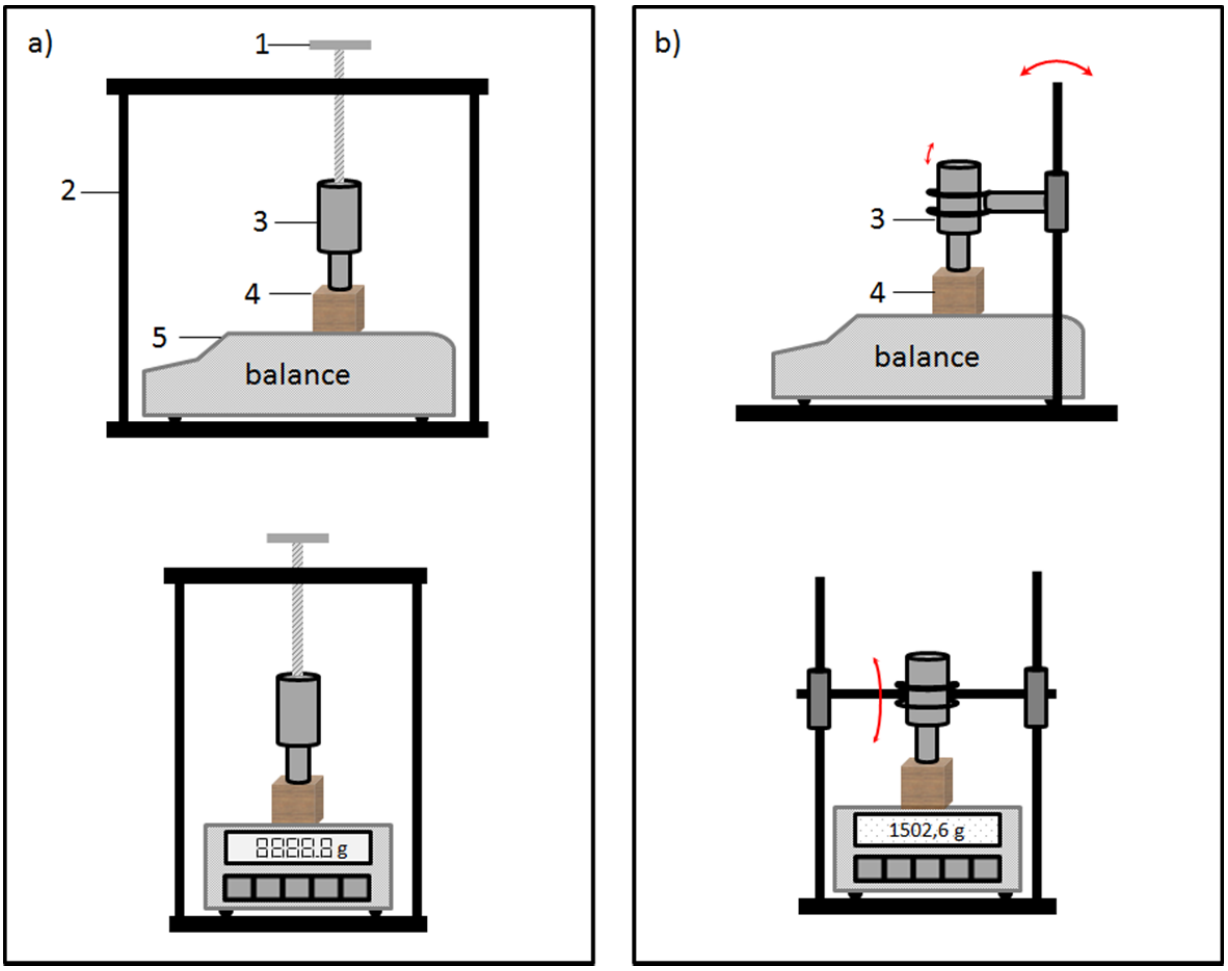

Figure SI-1. Schematic drawing of the experimental setups used in this study; a) – experimental setup A with minimized influence of losses of the swelling force due to the elasticity of the connecting materials and b) experimental setup B where quite a substantial amount of the swelling force is taken up by the elasticity of rods and clamps used to fix the sample on the balance pan

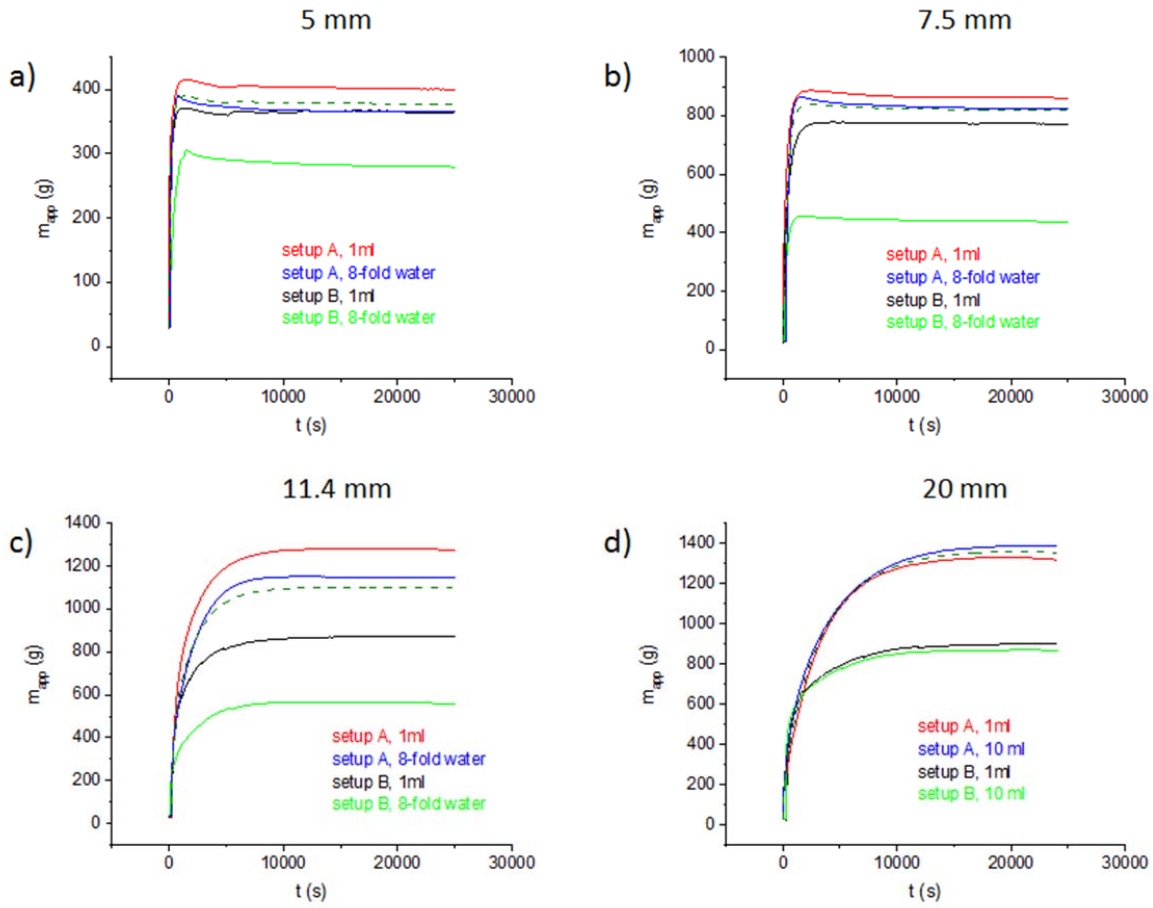

Figure SI-2. Temporal change of the apparent mass during the swelling of spruce wood cubes of different size (the edge length of the cubes is given on top of each graph); the data sets in each graph show the influence of the balance setup used for the measurements, the red and blue curves were obtained with setup A and the black and green curves with setup B (cf. Figure SI-1); the labels indicate the amount of water added at time zero, '8-fold' means that the amount of water added was eight times the volume of the wood cube; the average curve (dotted line) refers to the upper three curves for graph a) – c) and to the upper two curves for graph d)

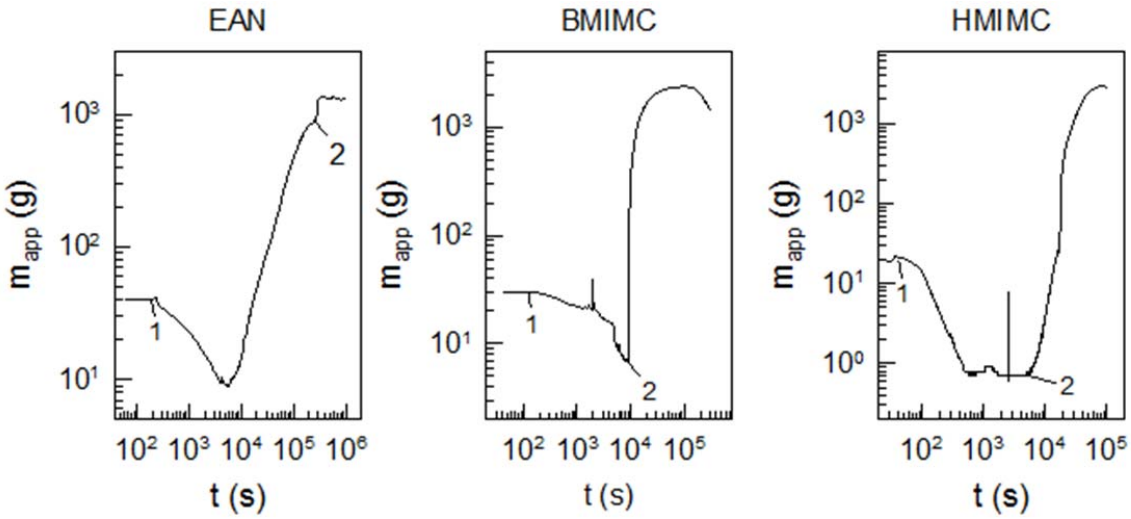

Figure SI-3. Apparent mass – time curves for swelling of spruce wood cubes (edge length of 20 mm) with different ILs as mentioned on top of each plot; 1 and 2 mark the addition of the corresponding IL and water, respectively; the measurement for EAN was carried out with setup B and those for BMIMC and HMIMC with setup A

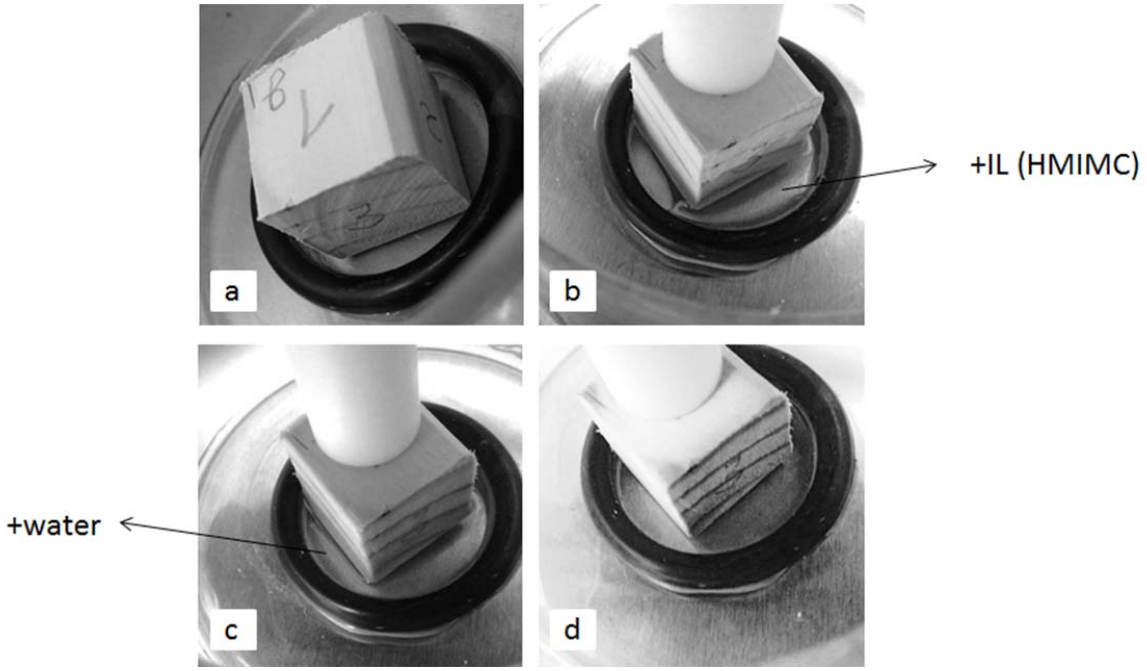

Figure SI-4. Snapshots illustrating the swelling of wood cubes (spruce) with ionic liquid (HMIMC) and water; a – before the addition of HMIMC, b – HMIMC was added and is placed between the black Viton ring and the wood and also the rise of the ionic liquid into the wood is visible, c – after the addition of water when still free ionic liquid was present, d – at the end of the swelling experiment when the water was evaporated and the ionic liquid is completely soaked up by the wood

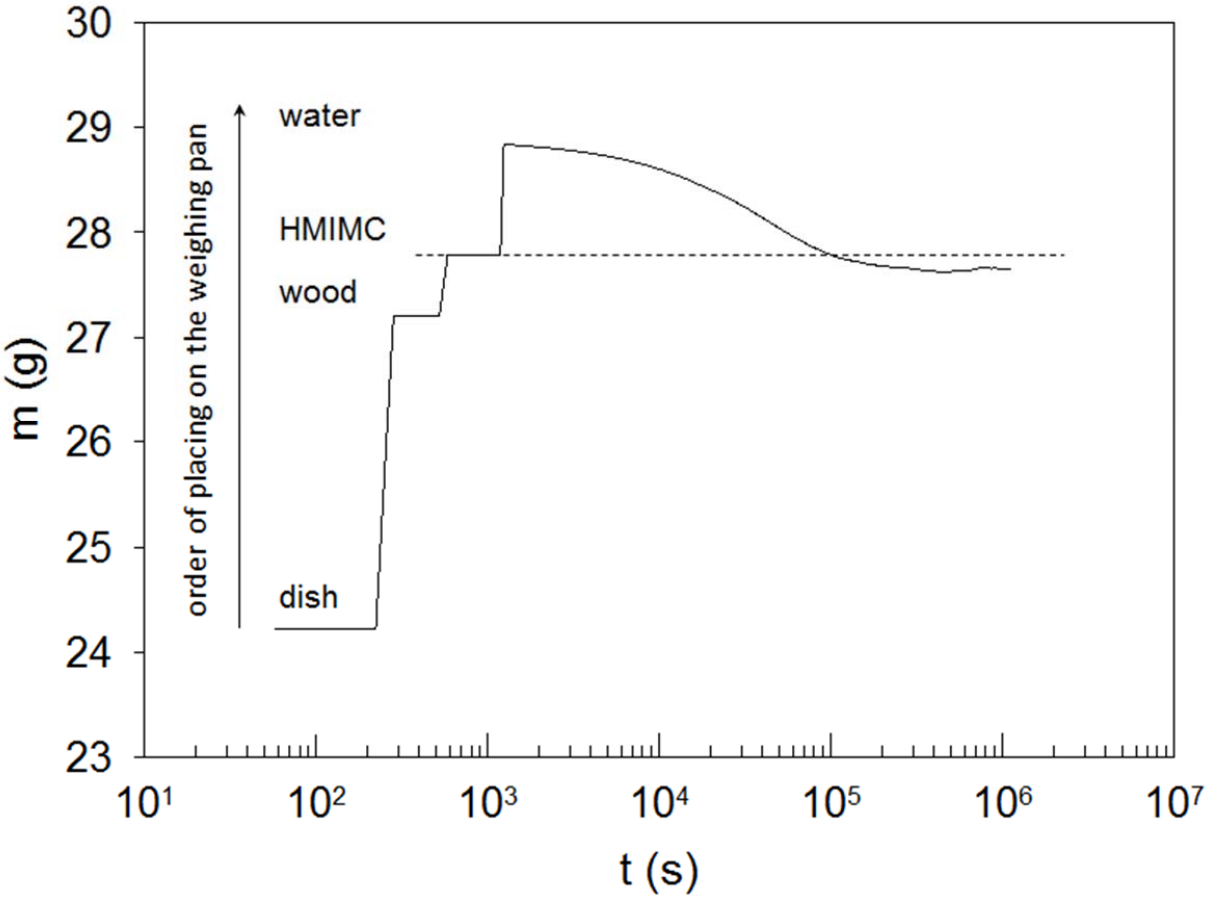

Figure SI-5. Whole record of the weighing pressure experiment here with a normal balance starting from placing the glass dish, the wood, addition of the ionic liquid (HMIMC), addition of water, and subsequent water evaporation

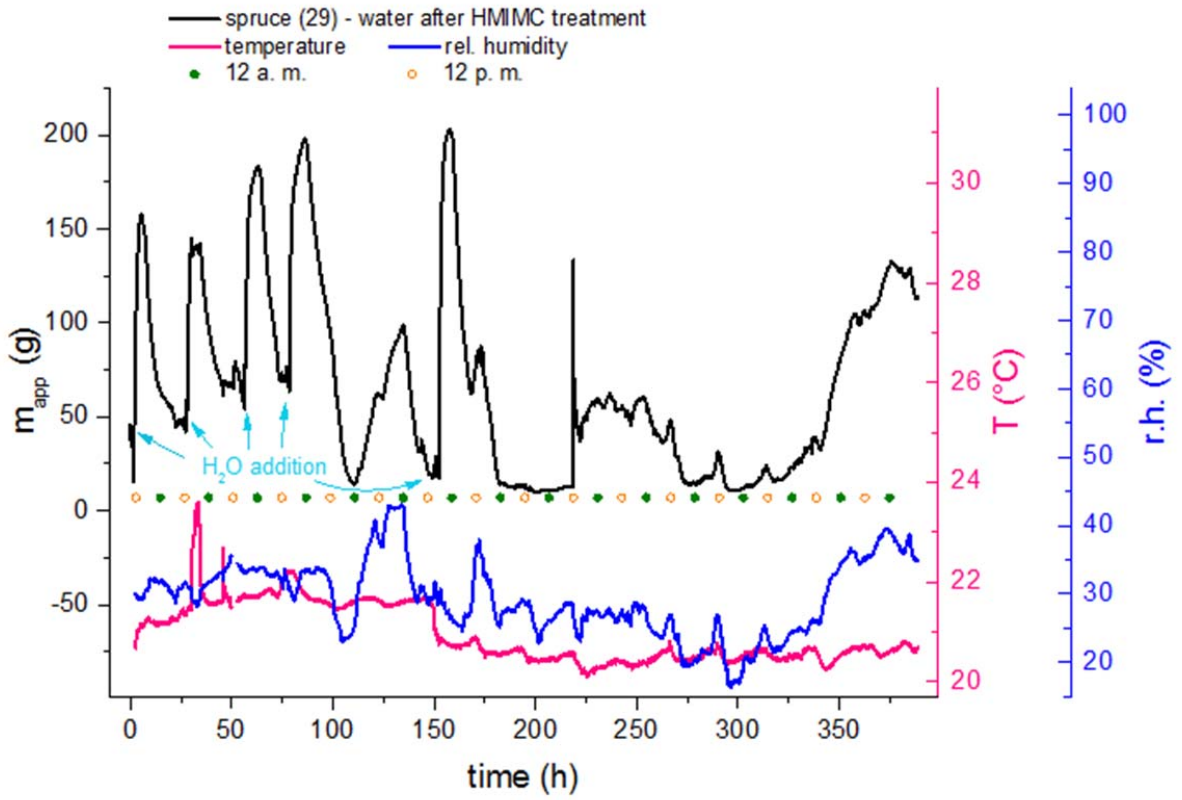

Figure SI-6. Temporal change of the apparent mass (left y-axis), the temperature (right y-axis, red), and the relative humidity (right y-axis, blue) during swelling experiments with a spruce cube (20 mm edge length) preswollen with ionic liquid (hexylmethylimidazolium chloride); the light blue arrows mark the different water additions, the changes after about 175 h (when the lastly added water has evaporated) are mainly due to changes in the relative humidity; the influence of the temperature is of less importance

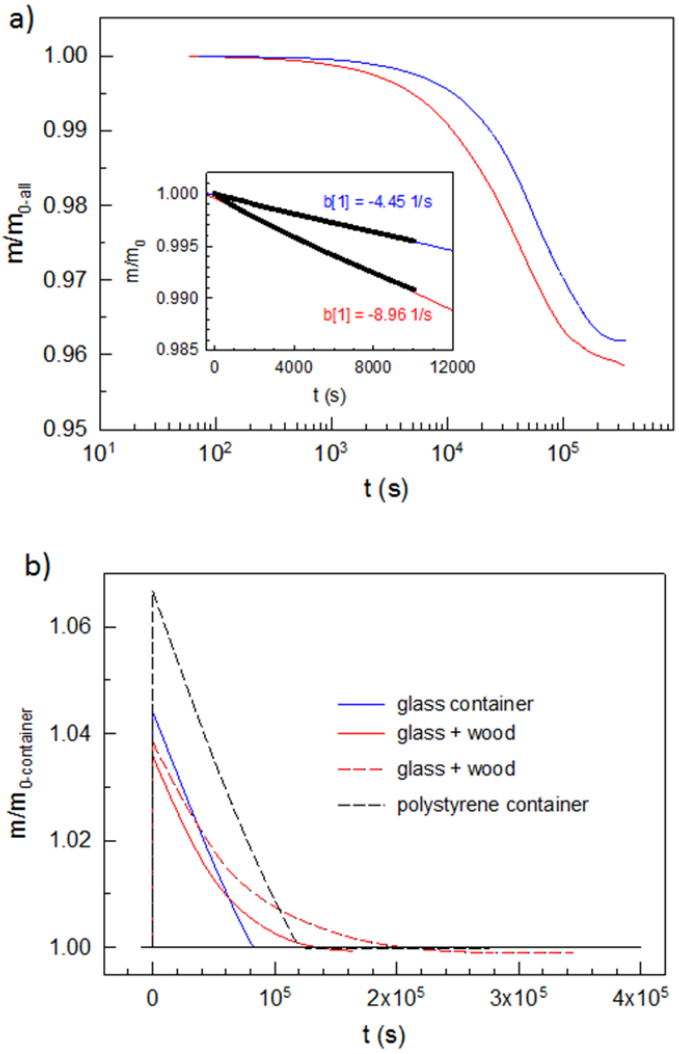

Figure SI-7. Water evaporation followed by mass – time curves expressed as relative changes normalized to the initial weight; graph a) the weight change is expressed as mass at given time (m) divided by the initial mass of all components ($m_{0\text{-all}}$) – for spruce wood (cube of 20 mm edge length) preswollen with ionic liquid, HMIMC, (solid and dashed red curve represent two repeats) and natural, untreated wood (blue curve); graph b) – comparison of water evaporation in the presence and absence of natural, untreated wood in the container, the weight change is expressed as mass at given time (m) divided by the initial mass of all components before the addition of water ($m_{0\text{-container}}$)

Movie SI-1. The movie shows the behavior of beech wood – aluminum joints prepared by swelling the beech with water (left) and by ionic liquid (ethylammonium nitrate, right) inside a vacuum oven at a pressure of 1 mbar and a temperature of 40 °C; the beech wood cylinder swollen with water releases from the aluminum ring after a drying time of 1 hour and 27 minutes

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