Supplementary materials

In the following, the hydrogen capacity is normalized to the maximum capacity of each individual measurement, to allow the comparability of the kinetics of the different experiments. The maximum capacities are written in section 3.

The milling parameters are listed in the caption of each figure.

Transformed sorption fraction for different additive contents

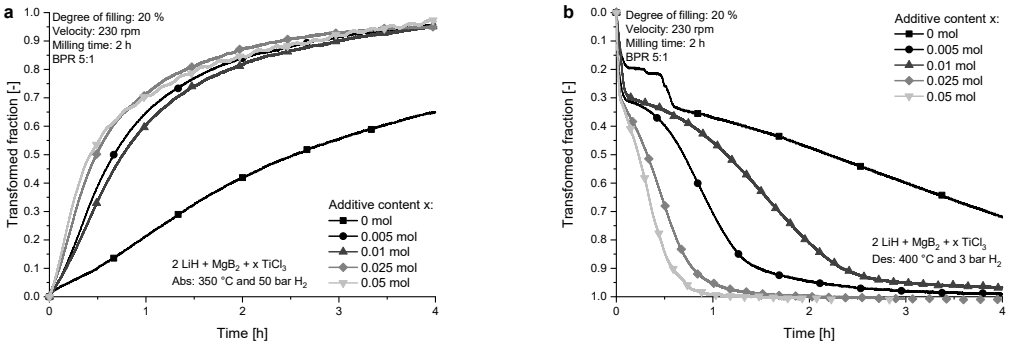

Figure S1. Transformed fraction as a function of time for different additive contents under (**a**) absorption and (**b**) desorption conditions. The settings used for milling were fixed: BPR of 5:1, velocity of 230 rpm, milling time of 2 h and degree of filling of 20 %.

Transformed sorption fraction for different BPR

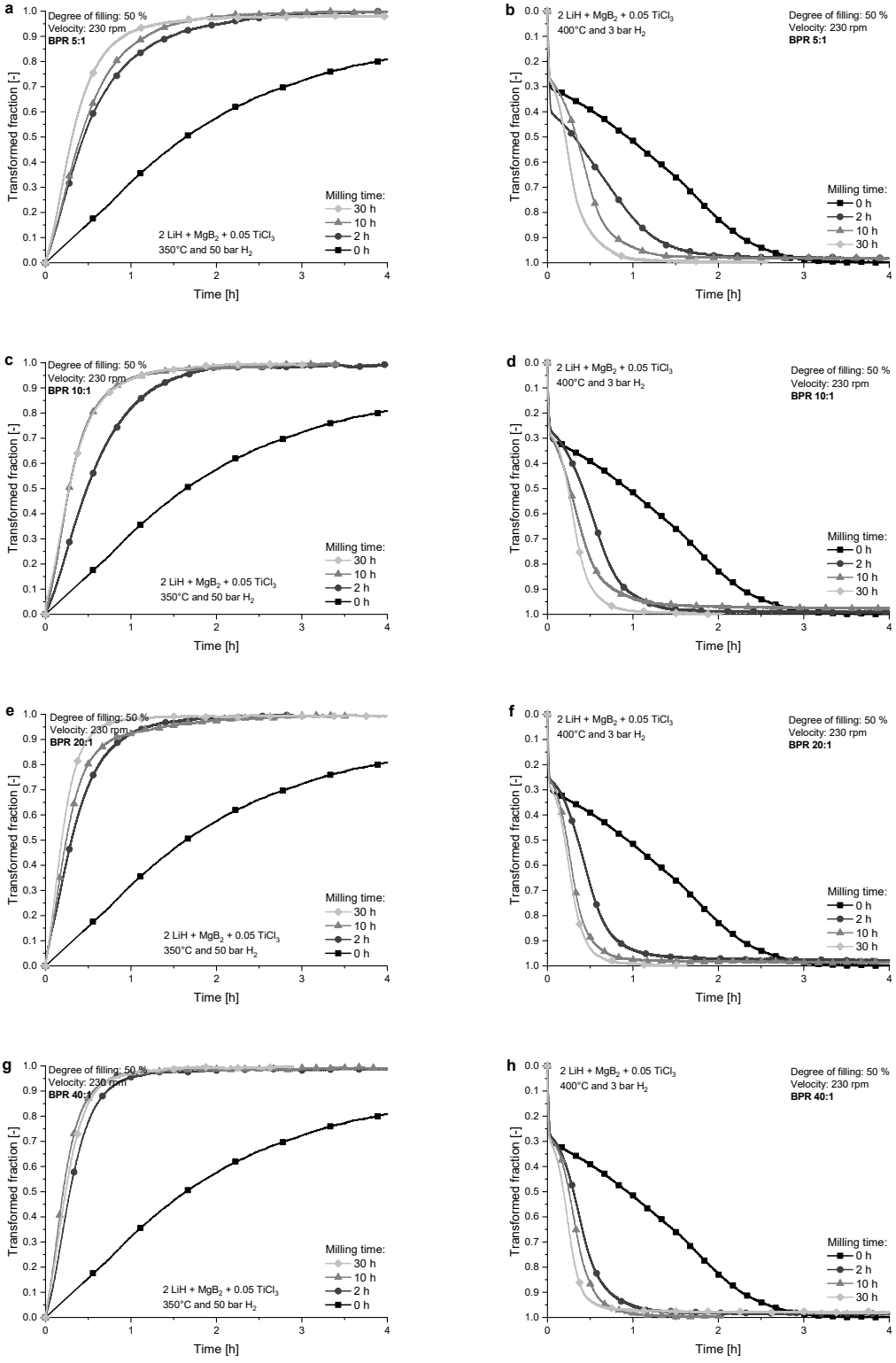

Figure S2. Transformed fraction as a function of time for different milling times under absorption conditions at 5:1 (**a**), 10:1 (**c**), 20:1 (**e**) and 40:1 (**g**) of BPR and desorption conditions at 5:1 (**b**), 10:1 (**d**), 20:1 (**f**) and 40:1 (**h**) at constant degree of filling of ~50 % and velocity of 230 rpm.

Transformed sorption fraction for different milling velocities

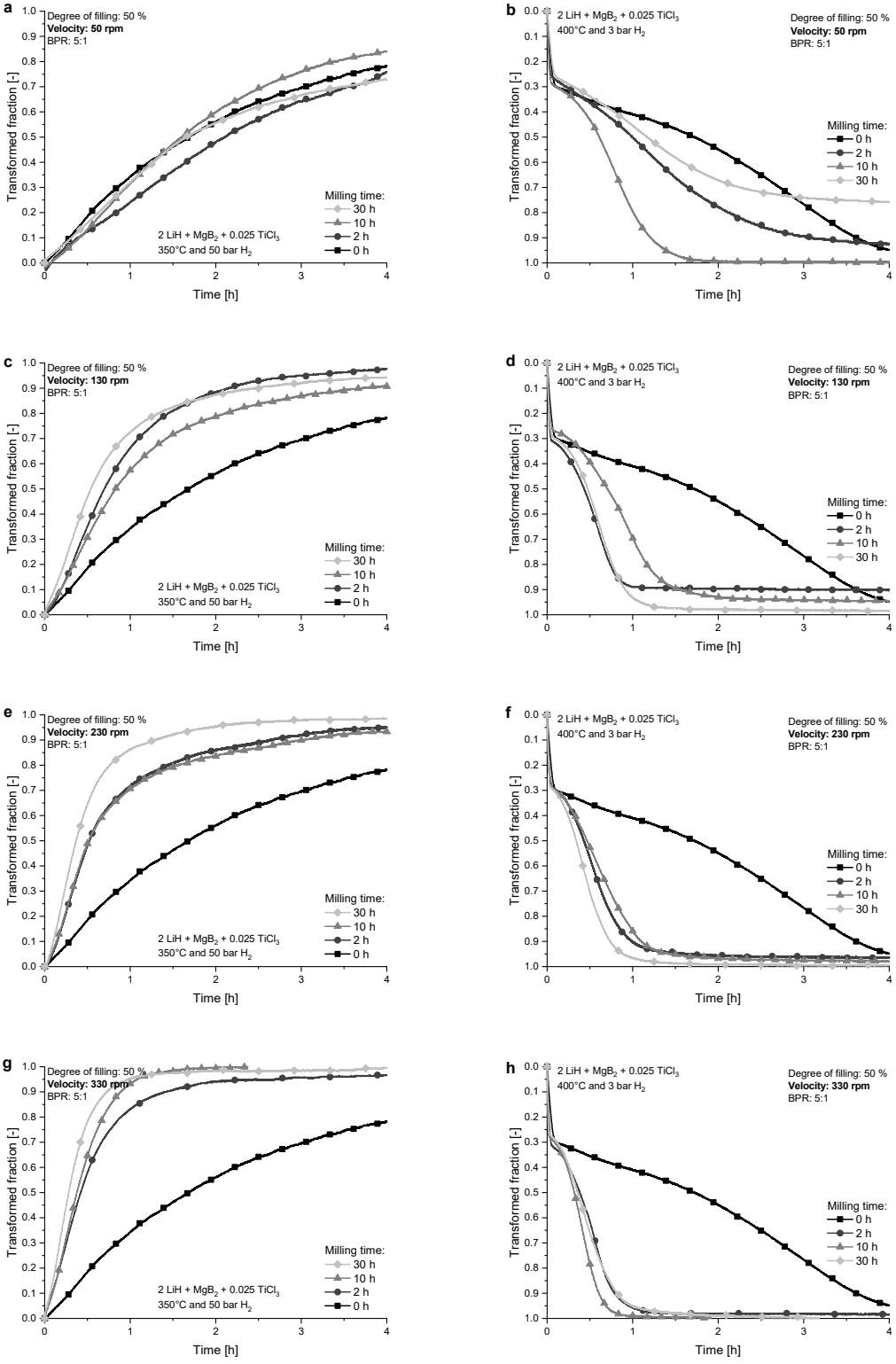

Figure S3. Transformed fraction as a function of time for different milling times under absorption conditions at 50 rpm (**a**), 130 rpm (**c**), 230 rpm (**e**) and 330 rpm (**g**) of milling velocity and desorption conditions at 50 rpm (**b**), 130 rpm (**d**), 230 rpm (**f**) and 330 rpm (**h**) at constant degree of filling of ~50 % and BPR of 5:1.

Transformed sorption fraction for different degrees of filling

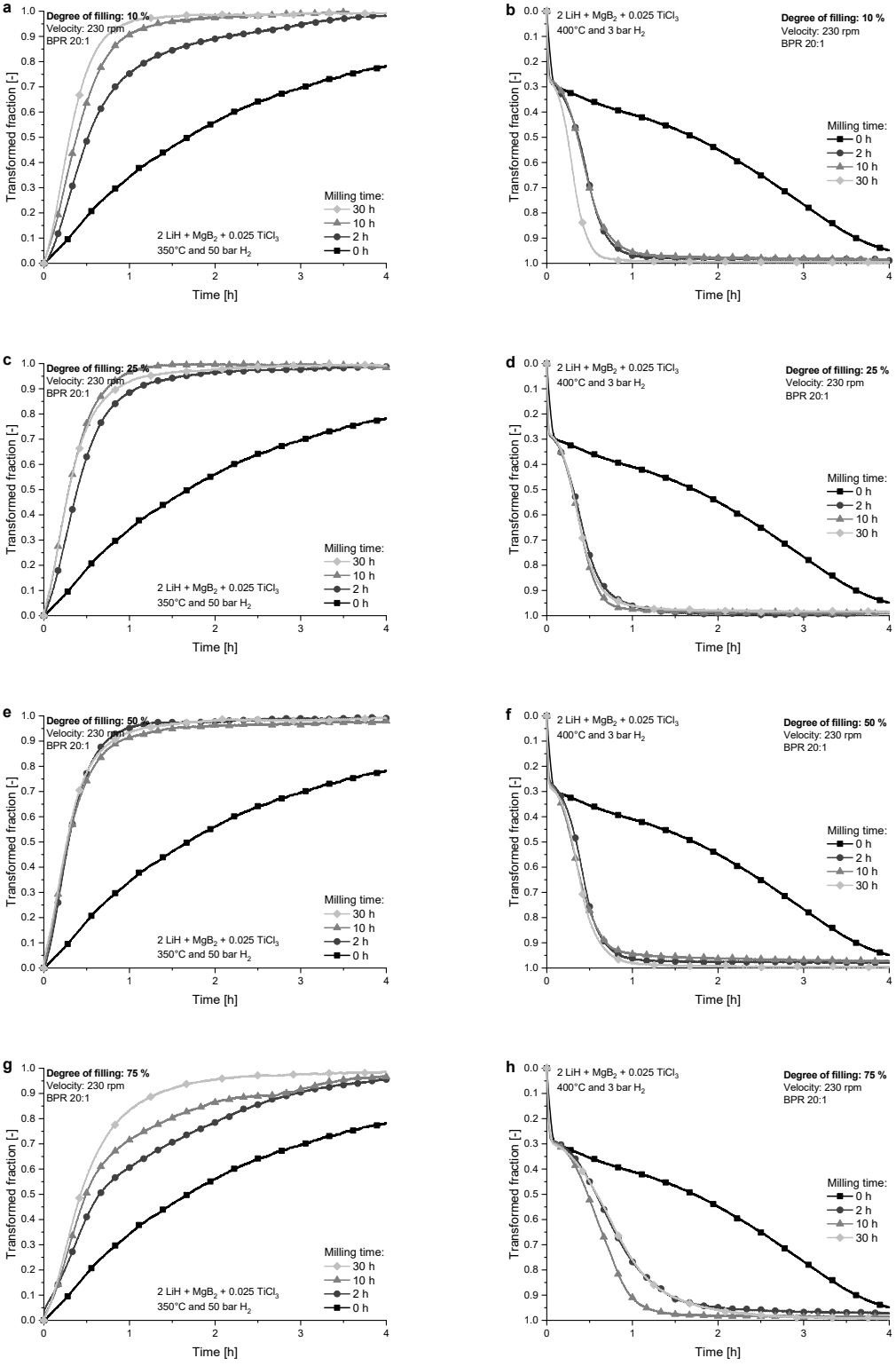

Figure S4 Transformed fraction as a function of time for different milling times under absorption conditions at 10 % (**a**), 25 % (**c**), 50 % (**e**) and 75 % (**g**) of filling and desorption conditions at 10 % (**b**), 25 % (**d**), 50 % (**f**) and 75 % (**h**) at constant velocity of 230 rpm and BPR of 20:1.