Supplementary material

S1. Proximate Analysis

S1.1 Moisture

Report NREL/TP-510-42621 was used. 1 gram of biomass (milled) was put in a crucible and dried at 105ºC until constant weight. Equation S1 was used for calculating the moisture. For statistical proposes this was done by triplicate.

$$\%Moisture = \frac{(Weight_{dry\ crucible+\ dried\ sample} - Weight_{\ crucible})}{Weight_{initial\ sample}} \qquad \text{(S1)}$$

S1.2. Ash

Report NREL/TP-510-42622 was followed. 1 gram of both of pea pod was weighted, put in a crucible, and inserted in a muffle furnace at 575 °C for 180 minutes. It was allowed to cool, and it was weighted. For statistical proposes this was done by triplicate and equation S2 was used.

$$\%Ash = \frac{Weight_{Crucible+ash} - Weight_{crucible}}{ODW_{sample}} \qquad \text{(S2)}$$

S1.3 Volatile Matter

Report ISO-18123-2015 was used as a guide. 1 gram of dried (milled) pea pod was added in a crucible, then a ramp to 900ºc in the muffle furnace was programmed and the biomass was introduced for 7 minutes. The weight loss equals the volatile matter content and is calculated with the equation S3.

$$Volatile\ Matter\ (\%) = (\frac{Weight_{sample+Crucible} - Weight_{(Final\ weight)}}{Weight_{sample+Crucible}}) \qquad \text{(S3)}$$

S1.4. Fixed Carbon

According to ASTM D 3172 – 89, the fixed carbon is a mathematical value corresponding to equation S4.

$$\%Fixed\ carbon = 100\% - (\text{Moisture } \% - \text{Ash } \% - \text{Volatile matter } \%) \qquad \text{(S4)}$$

S2. Reactors description

The LHW hydrothermal process was carried out in 100 mL batch reactors in which a ratio of 3 grams of biomass to 27 grams of water was added and autogenous pressure was maintained (Ratio 1 biomass/ 9 water). The reactor has a Teflon jacket, the reactor is made of stainless steel with a screw-type closure, and once the biomass was measured, the reactor was introduced into an oven with the respective temperature and reaction time. A switch to a different reactor was done at higher temperatures due to de stability of the Teflon.

Figure S1. LHW Batch 100 mL reactor for hydrothermal processes.

The reactions were carried out in 500 mL stainless steel batch reactors, which were filled with ratios of 10 grams of biomass and 90 grams of water (Ratio 1 biomass/ 9 water). Figure S2 shows the implemented reactor, which consists of a jacket (A), where the 500 mL stainless steel vessel is placed, 8 threaded studs (B) in the upper part that are adjusted, a heating blanket allows the regulation of the reaction temperature (C and D) and the coil (I) for the circulation of water to stabilise the temperature with the operation of the chiller (F) and its respective pump (E). The nozzles (K) allow to control the gas extraction, and if necessary an inert gas can be added to add pressure to the system (J), finally the system pressure is monitored using the manometer located in the reactor (L).

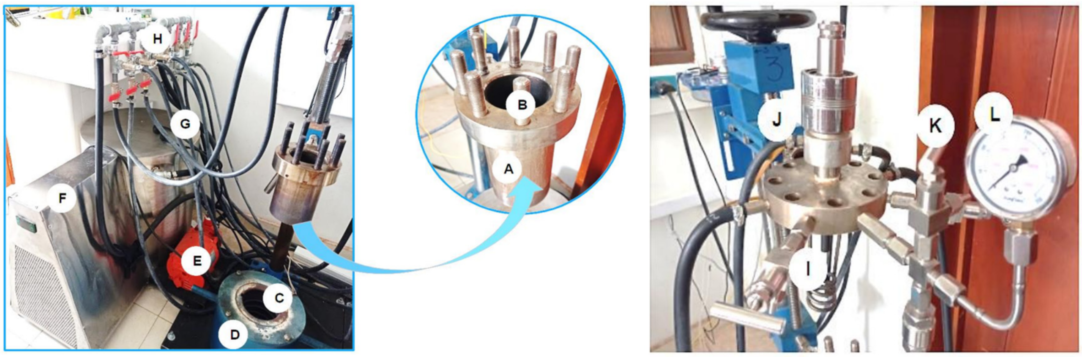

Figure S2. HTC 500 mL reactors for hydrothermal valorization.

S3. Kinetics of Hidrolysis

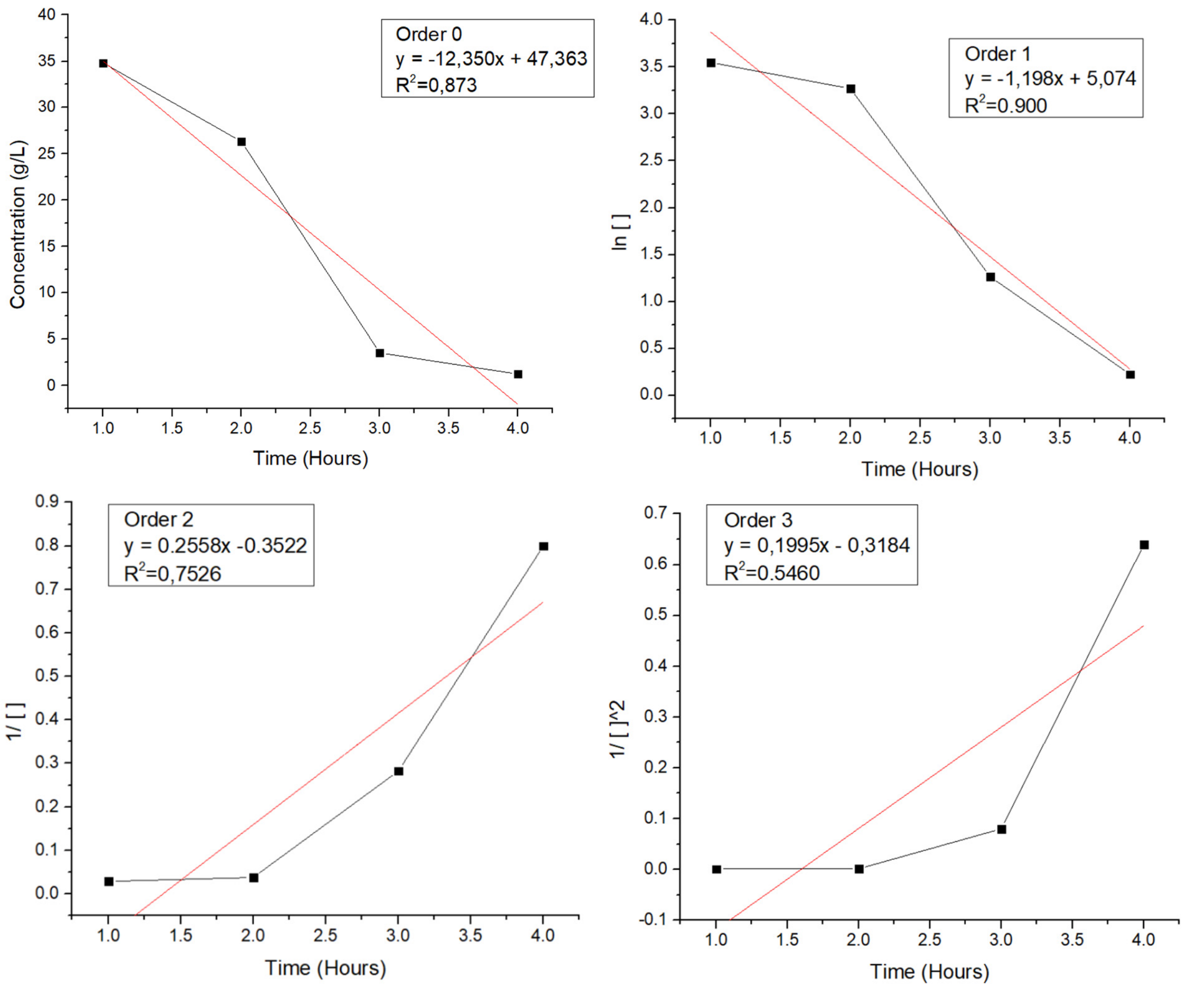

Figure S3. Overview of the kinetics of the hydrolysis by mathematical treatments.