Pre-process desilication of wheat straw with citrate

Effects of treatment time, citrate concentration, temperature, and pH on Si extraction from wheat straw prior to hydrothermal pretreatment were investigated for maximising Si removal and biomass recovery before biomass refining. With citrate, an almost linear negative correlation between Si content in the residual biomass and treatment temperature was observed up to 170 degrees C, yielding a Si removal of up to 97.7%. This high Si removal came at the expense of a low mass yield (down to 45%) in the insoluble lignocellulosic fraction. Optimum process conditions for high Si removal and high total mass yield were: 100mM sodium citrate, 130 degrees C, 60 min, 2% w/v solids, and pH of similar to 6.5 during extraction. Using the proposed process conditions, silica removal of up to 77% was achieved with a mass yield of 72.8%. This Si removal from the insoluble lignocellulosic fraction did not affect the enzymatic cellulose hydrolysis, neither negatively nor positively.

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