Ethanol production from rape straw: Part of an oilseed rape biorefinery

The aim of this study was 1) present an oilseed rape whole crop biorefinery; 2) to investigate the best available experimental conditions for production of cellulosic ethanol from rape straw, and included the processes of thermo-chemical pretreatment, enzymatic hydrolysis, and C6 fermentation, and 3) to couple cellulosic ethanol production to production of cellulolytic enzymes that are needed for cellulosic ethanol production, inside a rape straw biorefinery. For the first is based less on available experiments, and more on literature review. The second and third study conclusions were drawn based more on experimental findings, and less to literature review. In Chapter 1, the problem context and background theory for biorefineries is presented. Finally, latest developments of upscaled biorefineries in Europe are summarized. In Chapter 2, a scenario about upgrading and expanding a typical rapeseed biodiesel plant of Europe to an oilseed rape whole-crop biorefinery by 2020 is envisioned and discussed. The description and discussion of this biorefinery is based partly on literature review, and partly on own experimental data, especially on pretreatment of rape straw, and production of cellulosic ethanol and cellulolytic enzymes. Experimental findings are cited directly with the papers that are added as Paper I to III. Chapter 3 gives the overall conclusions from this thesis from both literature study and laboratory findings. At the end, Chapter 4 gives a future outlook for further research on the studied topic.