

# Abstract

Increased concerns over carbon dioxide emissions in the atmosphere, combined with the government awareness for energy security and limited fossil fuels reserves, set the tone for an imminent shift in the global energy paradigm over the next years. In this context, second generation ethanol appears as a promising substitute for liquid fuels. The recalcitrance structure of the biomass feedstock however, requires the employment of a pretreatment step in the production process to release the sugars for conversion. Several pretreatment methods have been studied in the past years, but a general consensus is yet to be built as different types of biomass are constantly emerging as alternatives for production. Moreover, process steps interconnections play an important role in the final feasibility of the process and are all too often disregarded in favor of local optimization. The main objective of this thesis can be divided in two scopes: the first is to understand the particularities of the pretreatment methods in relation to setup requirements and interactions with different biomasses from the process point of view; and the second is to assess the effect of the pretreatments in a full biorefinery system, technically, economically and environmentally wise.