

PhD. Thesis Title

Design, Economic Evaluation and Control of Olefin Metathesis Processes

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Abstract

This thesis addresses the conceptual design, economical optimization, and control strategies of an olefin metathesis unit for propylene production. The thesis provides an overview of the existing industrial applications for propylene production. It also presents theoretical aspects regarding dynamic modelling (with emphasis on system identification) and process control by conventional and advanced strategies (such as model predictive control). The original contributions are: (a) conceptual design of on-purpose propylene production via the 2-butene metathesis process; (b) economic optimisation of a reactor-separation process, with the aim of minimizing the total annual cost; (c) conventional and model predictive control of 2-butene metathesis unit. The conclusions emphasize the feasibility of producing ethylene and propylene from low-cost feedstock (2-butene) using tungsten mesoporous catalysts. Economic considerations favour the once-through reactor-separation flowsheet. Both conventional and model predictive control demonstrate effective dynamics control, with potential for further improvement in by-products generation through recycling.