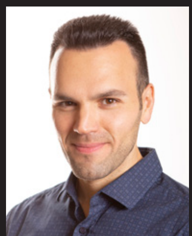
This thesis presents work that was done within the Swedish Centre for Resource Recovery (SCRR). Research and education performed within SCRR identifies new and improved methods to convert residuals into value-added products. SCRR covers technical, environmental and social aspects of sustainable resource recovery.



In order to meet the soring global energy demand, fossil energy and fuel sources have been over-exploited at an extraordinary rate, imposing dramatic climate changes and threatening energy security and economic stability. These general environmental, socio-political, and economic concerns have veered the global attention toward the production and application of alternative renewable energy and fuel sources such as biofuels. Bioethanol has long been one of the main biofuels of interest that can be produced sustainably from a variety of feedstocks. However, the choice of raw material for bioethanol production has been a matter of controversy in the past decades. Lignocellulosic materials (e.g., agricultural residues) are potential candidates for sustainable bioethanol production (second generation bioethanol). However, in order to have a commercially feasible process, the complexities associated with lignocellulosic bioethanol production in pretreatment, hydrolysis, fermentation and downstream processing stages should be alleviated.

Membrane bioreactors with their great capabilities in semi-selective separation of different medium constituents are promising options for making a breakthrough in lignocellulosic biorefinery processes. Therefore, in this thesis, immersed membrane bioreactors that are well-developed technologies used for long in water and wastewater treatment processes, were used to tackle challenges and enhance lignocellulosic bioethanol production. In this regard, pressure-driven immersed membrane bioreactors were used to intensify lignocellulosic bioethanol production process by facilitating continuous hydrolysis and fermentation, cells and suspended solids separation, sugars and ethanol recovery, and physical bacteria decontamination. Furthermore, the new concentration-driven membrane technique of reverse membrane bioreactor was introduced in this thesis and practiced for simultaneous substrate utilization, inhibitor detoxification and lignocellulosic bioethanol fermentation.

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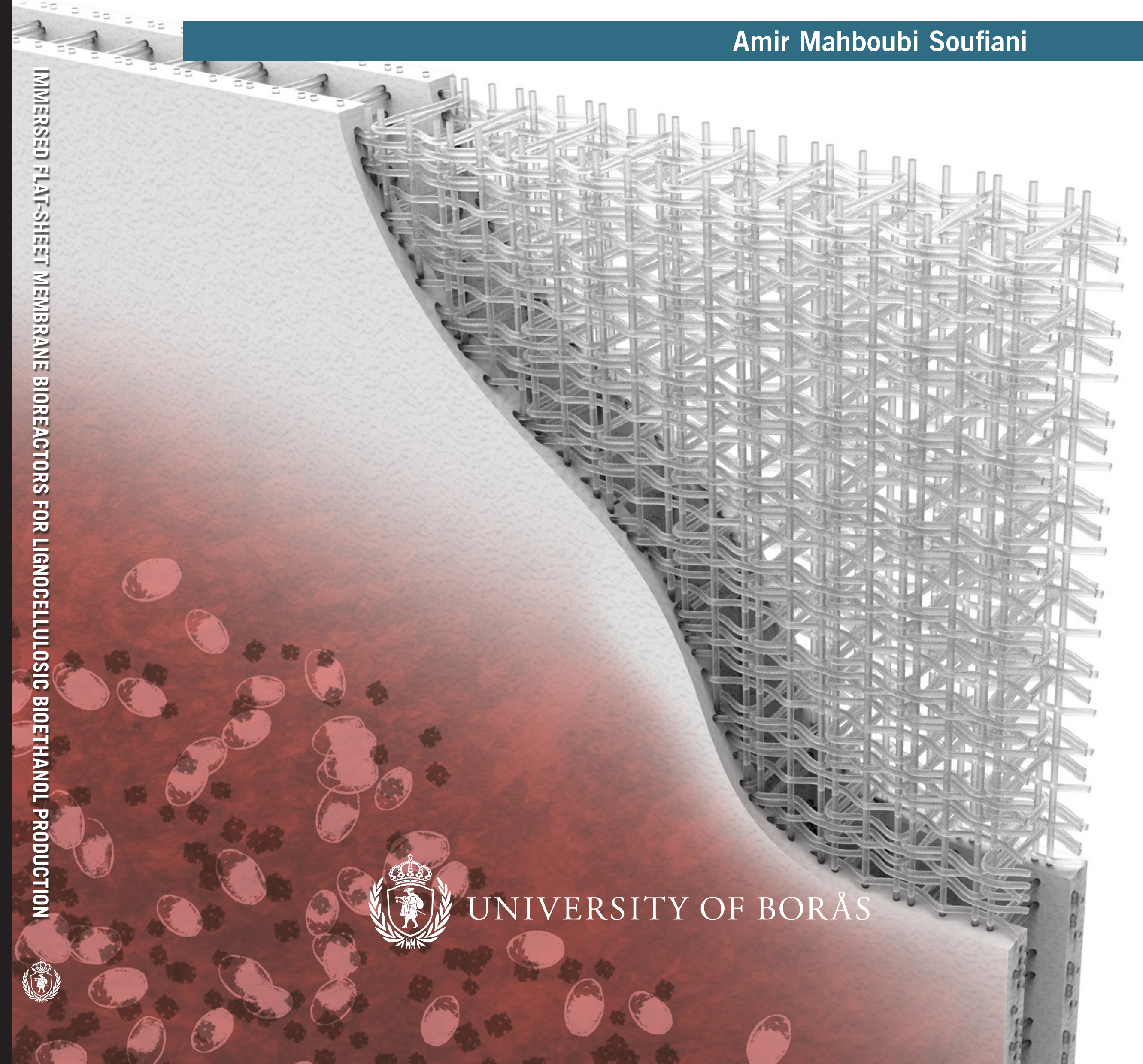

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