Membrane recycle fermentors

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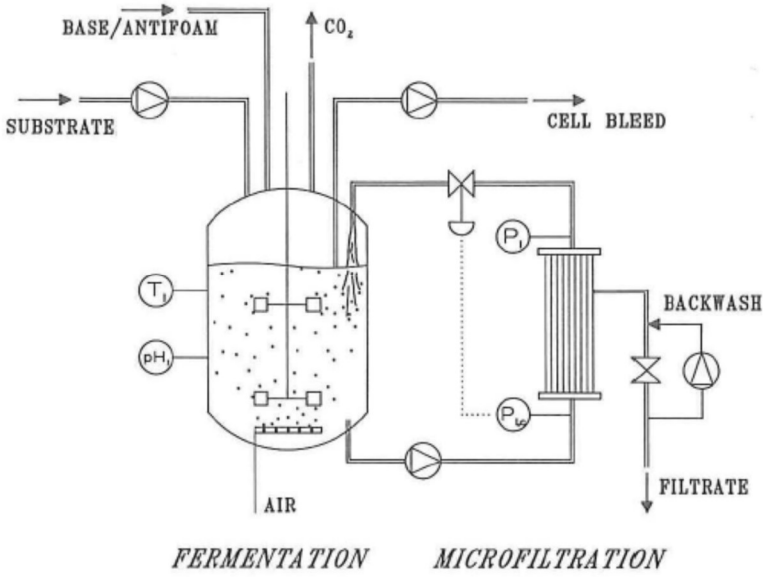
Description



Membranes can successfully be applied for the optimization of an ethanol fermentation process. Membrane filtration can be used for the purpose of cell recycle in order to increase the productivity. Pervaporation and perstraction can be used for the recovery of alcohol during fermentation in order to increase the substrate conversion. The increase in productivity and substrate conversion may lead to a reduction of the production costs of ethanol, in comparison with traditional processes like batch and continuous fermentation with ethanol recovery by distillation. Membrane methods can be regarded as straightforward unit-operations, which can readily be integrated with an ethanol fermentation.
Membrane recycle fermentors are used successfully on laboratory scale. The design of a process on larger scale however is obstructed by the lack of relevant data in literature. Compared to a stand-alone fermentor a membrane recycle fermentor presents new features which must be considered in the design. These features include the use of high-density cultures, the additional volume in the membrane section and the circulation of the broth. In this project these aspects are studied with measurements, modelling and analysis using the characteristic time concept, in case of an ethanol fermentation integrated with microfiltration. The analysis shows that depending on the reactor configuration used, concentration gradients can be expected. These gradients may decrease the efficiency of the fermentation, or can be advantageous, for example by letting the substrate conversion approach completion in the membrane section. Integration of pervaporation and microfiltration is considered with respect to process design and economics.

Publications from the project

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