

CHAPTER II

LITERATURE REVIEW

This chapter will be focused on literature review of available methods used to improve the permeation performance in microfiltration and their advantages and disadvantages. The alternating ways used to enhance the permeation performance, ultrasonic microfiltration, is also be included.

The available methods being applied to enhance the performance of microfiltration, e.g., pulsed-feeding, back washing, and rotating filtration. The advantages and disadvantages of these methods are illustrated in Table 2-1

Table 2-1 Advantages and disadvantages of methods used to improve permeation performance in microfiltration.

method	advantages	disadvantages
pulsed-feeding	- can be operated without any added auxiliary equipment	- heavy-duty pumping system required
back washing	- can be operated without any added auxiliary equipment	- production and cleaning cannot simultaneously occur
rotating filtration	- the microorganisms were not be damaged	- the performance for large scale production was limited

Besides all previous methods, ultrasonic irradiation is an alternative method used. With the widely use of ultrasonic waves in cleaning application, the idea of applying ultrasound to filtration was therefore introduced.

In 1995, Kokugan et al [4] investigated the effect of ultrasonic irradiation on ultrafiltration (UF) properties by using three kinds of solutions : in which a gel layer was easy to form, difficult to form and whose properties were in between . With ultrasonic irradiation, 40% increase in permeate flux was reported. Moreover, the ultrasonic irradiation had a tendency to decrease the observed rejection slightly by increasing permeate flux whether a gel layer forms on the surface or not.

In 1996, Matsumoto et al [2] reported that cross-flow microfiltration with ultrasonic wave cleaning can prevent membrane fouling, demonstrated in terms of the increasing of permeate flux and observed rejection. With ultrasonic waves, at the optimum conditions of membrane pore size and operating pressure, a 4 to 6 times higher steady-state flux of suspension containing dry baker's yeast was obtained, even at a low feed flow velocity.

In conclusion, An ultrasonic irradiation has a tendency to increase the permeation performance of filtration with many advantages over the other methods such as the production and cleaning can simultaneously occur, and the high performance pumping system is not required. However, the equipment used in those works was an ultrasonic bath immersed with the membrane which is not suitable for the existing module used. The development of a microfiltration in tubular module attached with an ultrasonic source is, hence, our research objective.