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Performance of rotating membrane emulsification for o/w production

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1. Introduction

The conventional process for emulsification based on rotor–stator system, high pressure homogenizer and ultrasonic waves use droplet break-up as dispersing mechanism and usually couple with considerably input and high shear stress [1]. In order to solve the limitation of conventional production of emulsion, a new method called membrane emulsification has been developed [2]. This new method has been proven as a superior technique for producing emulsion [3,4]. A new development of membrane emulsification that is called rotating membrane reactor (RMR) is introduced [5]. The membrane has been modified to rotate or through the use of spinning membrane tube. It is expected that the membrane rotation can increase the productivity of membrane emulsification and well suited to the production of solids and capsules.

2. Experimental

Emulsions were prepared using low viscosity paraffin wax as the dispersed phase. Two types of emulsifiers those are 2% (w/w) Tween 20 and 2% (w/w) sodium dodecyl sulphate were used. Carbomer (Carbopol EDT 2050), a crosslinked polyacrylic acid polymer was chosen as a stabilizer. A stainless steel membrane with laser drill pores was used. The membrane has mean pore diameter of 100 μm, wall porosity 3% with regular square pore arrangement and the effective membrane area was 26.7 cm^2. The effects of membrane rotational speed, emulsifier concentration, stabilizer concentration and dispersed phase flow rate have been investigated. Droplets were characterized by average droplet diameter, droplet size distribution and coefficient of variation of droplet size distribution.

3. Results and discussion

The RMR produced monodispersed emulsions in the range of 81–567 μm with membrane rotation speed from 0 to 1500 rpm using Tween 20 and SDS as emulsifier. In general, on increasing membrane rotational speed smaller droplets were generated. The coefficient of variation of size distribution of the droplets confirmed that they could be described as

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