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EMULSION PRODUCTION USING ROTATING MEMBRANE EMULSIFICATION

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Abstract

Membrane emulsification has been proven as a new technique for emulsion production due to the capability to produce narrow droplet size distribution, monodispersity emulsions, lower shear stress, less surfactant required as well as lower energy input. However, particle size and size distribution can be varied to some extent since the droplets emerging from the membrane have a tendency to coalesce. In addition, the membrane pores have possibility to clog because of droplet adhering and/ or spreading over the membrane surface especially if the discontinuous phase is viscous. Finally, if the clogging persists the overall performance of the membrane deteriorates and droplet size and size distribution will vary as well.

In the production of semi-solid droplets or particulates, using a batch and continuous manufacturing operation, the circulation and transport of the products is also problematic since the effects of fluid shear in circulation the continuous phase (in pipes and pumps) can cause the products damage. In order to overcome the difficulty of circulation and transport of product, the droplets coalescence as well as the droplets clogging over the membrane surface, the utilization of rotating membrane emulsification has been developed. The application of membrane spin provides the phase within membrane compartment passes through the membrane and subject to a centrifugal force.

The research was carried out using a stainless steel membrane tube with laser drill pores. The membrane tube rotated in a stationary glass cylinder by means of overhead stirrer. The O/W emulsion was produced using Tween 20 emulsifier, paraffin wax as dispersed oil phase and Carbomer stabilizer. The emulsion properties were considered in the expression of number of droplets, droplet diameter, coefficient of variation of droplet diameters (CV) and span. In this research, the influence of speed rotation of the membrane tube and stabilizer concentration on emulsion properties was investigated. Furthermore, an optimal condition for monodispersed emulsion production was also found.