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Development of Application of New Membrane Emulsification Systems for Product Formulation

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Membrane emulsification is a relatively new technique for the highly controlled production of emulsions and particulates. The process conventionally involves the use of cross flow system in which the dispersed phase is pressurised to permeate through the pores on the wall of a porous membrane. The continuous phase runs at the other side of the membrane, providing the required shear force to detach the emerging droplets. Membrane emulsification boasts many advantages over conventional emulsification methods, such as capability of precision manufacture of emulsions with extremely narrow droplet size distributions, reduced energy consumption, and guaranteed scale-up performance. This paper reviews the status of membrane emulsification technologies and reports new work on spinning stainless steel membranes for manufacture of oil in water emulsions. The tubular membrane, which has laser drilled pores of uniform size on its wall, is mounted on a conventional overhead stirrer to rotate at adjustable speeds. The oil phase is dispatched via a rotary seal from inside to the outside of the membrane tube into the aqueous solution containing emulsifier. The method enables use of the centrifugal force from the spinning membrane rather than the shear force produced by the continuous phase cross flow. The circulation of the continuous phase around a membrane tube system can thus be totally avoided. This can be particularly advantageous to the production of coarse emulsions and complex fragile structured products, in which the droplets and/or particles are subject to break up during the pump circulation. In addition, the new system allows to undergo secondary reactions within multiple emulsions/templates (e.g. cross linking of droplet wall, crystallisation, precipitation, gelation) directly. Prospects for use of this new methods of formulation of novel products are discussed

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