

Accepted Manuscript

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Chau Chun Beh, Raffaella Mammucari, Neil R. Foster

PII: S1385-8947(14)01695-7
DOI: <http://dx.doi.org/10.1016/j.cej.2014.12.072>
Reference: CEJ 13073

To appear in: *Chemical Engineering Journal*

Received Date: 18 August 2014
Revised Date: 8 December 2014
Accepted Date: 18 December 2014

Please cite this article as: C.C. Beh, R. Mammucari, N.R. Foster, Process Intensification: Nano-Carrier Formation by a Continuous Dense Gas Process, *Chemical Engineering Journal* (2015), doi: <http://dx.doi.org/10.1016/j.cej.2014.12.072>

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Process Intensification: Nano-Carrier Formation by a Continuous Dense Gas Process

Chau Chun Beh, Raffaella Mammucari*, Neil R. Foster*

School of Chemical Engineering, UNSW Australia

*Authors to whom correspondence should be addressed;

Tel: +61 2 9385 4341; Fax: +61 2 93855966; Email: n.foster@unsw.edu.au;

Tel: +61 2 9385 5575; Email: r.mammucari@unsw.edu.au

Abstract

Formation of nano-carriers such as vesicles and micelles using dense gas processing has been under extensive research for decades. Several dense gas processes have been developed to produce nano-carriers, most of them being batch processes. In the present study, a novel continuous dense gas, known as Nano-carrier by a Continuous Dense Gas (NADEG) process was developed as an evolution of a dense gas batch process known as the Depressurization of an Expanded Solution into Aqueous Media (DESAM) process. Transforming a batch process into a continuous process is a main aspect of process intensification. The NADEG process developed in this work enhances the production output of the batch process while producing nano-carriers free of harmful residual organic solvent. The NADEG process is a one-step process for the production of nano-carriers with lower size and higher encapsulation efficiency than the nano-carriers produced by other batch processes. Encapsulation efficiencies as high as 15% were achieved using liposomes to encapsulate a model hydrophilic compound (isoniazid) while encapsulation efficiencies of 10% were achieved in polymersomes for the same model compound.

Keywords: Liposomes; Polymersomes; Micelles; Dense Gas Technology; Supercritical Fluid Technology; Continuous process

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