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Review

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Multiphase processes with ionic liquids in microreactors: hydrodynamics,

mass transfer and applications

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Abstract

Microreaction technology is an important technology for process intensification and high efficient chemical synthesis. The use of ionic liquids (ILs) as novel reaction media is another rapidly developing orientation for process intensification considering their strong dissolubility, low vapor pressure and adaptable physicochemical properties. The combination of the two technologies has been emerging fast in various applications, due to the ability to intensify the utility of ILs in microreactors. This review presents a summary of the recent progress on the transport and reaction processes with ILs in microreactors. A typical characteristic of ILs is their higher viscosity, so the effects of fluid viscosity on the hydrodynamics and mass transfer are highlighted. In addition, new correlations considering both shear and inertial forces are proposed to predict the flow regime transitions in a wide range of fluid viscosity. With respect to mass transfer, the unit cell model for Taylor flow is modified to represent the effect of viscosity on flow topology inside droplets/slugs.

Keywords: Multiphase; Ionic liquid; Mircochannel; Microfluidic; Micromixing; Mesoscale

1. Introduction

Microreaction technology have been more and more frequently applied in chemical synthesis and process intensification (Adamo et al., 2016; Chen et al., 2008; Chen et al., 2013; Hessel et al.,

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