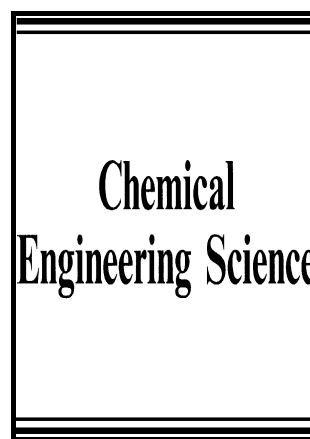


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# Using microchannels to visually investigate the formation and dissolution of acrylonitrile droplets in a bio-hydration system

Jiahui Li<sup>1</sup>, Yang Chen<sup>1</sup>, Mingzhao Guo, Yujun Wang\*, Jianhong Xu, Guangsheng Luo, Huimin Yu

The State Key Lab of Chemical Engineering, Department of Chemical Engineering, Tsinghua University, Beijing 100084, China

\*Corresponding author: Tel: 86-10-62783870, Fax: 86-10-62770304

E-mail address: wangyujun@mail.tsinghua.edu.cn

## Abstract

Coaxial microfluidic devices were used to investigate the formation of acrylonitrile droplets and the dissolution of acrylonitrile during the droplet generation stage in a bio-hydration system. The average mass transfer coefficient of acrylonitrile was obtained using an online visual measurement method. The average mass transfer coefficient of acrylonitrile in water increased from  $3.91 \times 10^{-3}$  to  $11.80 \times 10^{-3}$  m/s and the droplet size decreased from 85 to 55  $\mu\text{m}$  when the flow rate of the continuous phase was increased from 40 to 200  $\mu\text{L}/\text{min}$ . In contrast, the average mass transfer coefficients of acrylonitrile in a 900 U/mL free-cell solution ranged from 5.95 to  $14.56 \times 10^{-3}$  m/s under the same conditions, while the bio-reaction rarely affected the size of the generated droplet. In addition, the increase of the acrylamide concentration changed the flow pattern from the dripping regime to jetting and laminar regimes and significantly reduced the droplet size.

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