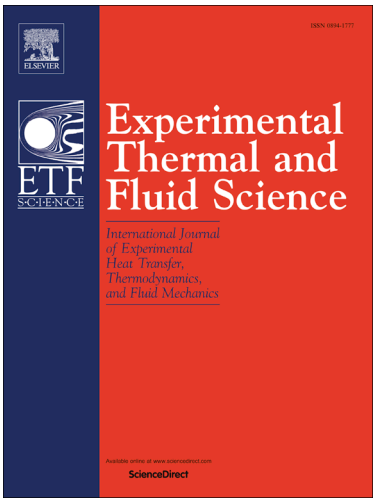


# The Rising Behaviors of Single Bubbles in Stagnant Turpentine and Pine Resin Solutions

Chengrong Huang, Linlin Wang, Xiaopeng Chen, Xiaojie Wei, Jiezhen Liang

PII: S0894-1777(18)30695-2
DOI: https://doi.org/10.1016/j.expthermflusci.2018.05.009
Reference: ETF 9474

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 7 December 2017
Revised Date: 24 April 2018
Accepted Date: 13 May 2018

Please cite this article as: C. Huang, L. Wang, X. Chen, X. Wei, J. Liang, The Rising Behaviors of Single Bubbles in Stagnant Turpentine and Pine Resin Solutions, *Experimental Thermal and Fluid Science* (2018), doi: https://doi.org/10.1016/j.expthermflusci.2018.05.009

# The Rising Behaviors of Single Bubbles in Stagnant Turpentine and Pine Resin Solutions

**Chengrong Huang[a], Linlin Wang[a,b,*], Xiaopeng Chen[a,b,*], Xiaojie Wei[a,b], Jiezhen Liang[a,b]**

[a]*School of Chemistry and Chemical Engineering, Guangxi University, Nanning 530004, PR China*

[b]*Guangxi Key Laboratory of Petrochemical Resource Processing and Process Intensification Technology, Guangxi University, Nanning 53004, PR China*

**ABSTRACT:** Rise characteristics of single bubbles with diameters ranging from 0.5 to 4.0 mm in turpentine and pine resin were visually observed at 25 °C by the techniques of high-speed photography and digital image analysis. Despite it´s widely use in chemical engineering and others, the researches about pine resin on gas-liquid two phase flow is far from being solved. The purpose of the present paper is to assess the moving characteristics of single bubble in turpentine and pine resin solutions. The bubbles rise along a rectilinear path when the diameter d≤1 mm. The amplitude of the trajectory oscillation becomes weaker with the increase of the solution concentration. Bubble trajectory closely related to liquid viscosity and bubble diameter. The bubble rise velocity increased with bubble size to a maximum value, after which the velocity fell slowly with further increases in the bubble size. Measured rising velocities of single bubbles were compared with typical correlations. The comparison showed that the model by Tomiyama et al. (1998) gives a good prediction almost throughout the observed range, though it tends to slightly overestimate the data for small bubbles. The physics of the Tomiyama model were discussed.

*Keywords*: Single bubble; Trajectory; Rising velocity; Turpentine; Pine resin

## 1. Introduction

Gas− liquid two− phase flows are frequently encountered in industrial processes, such

[*]Corresponding author. Tel.: +86–771–3272702; fax: +86–771–323–3718

*E–mail address:* wanglinlin1971@sina.com; lilm@gxu.edu.cn;