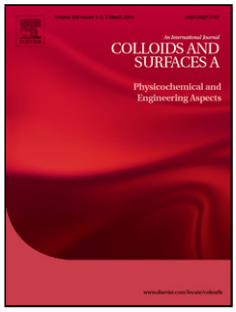

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PII: S0927-7757(14)00538-X
DOI: http://dx.doi.org/doi:10.1016/j.colsurfa.2014.05.078
Reference: COLSUA 19279

To appear in: *Colloids and Surfaces A: Physicochem. Eng. Aspects*

Received date: 12-12-2013
Revised date: 30-5-2014
Accepted date: 31-5-2014

Please cite this article as: A. LEKHLIFI, J. OUAZZANI, M. ANTONI, Drainage of water droplets in a bounded paraffin oil continuous phase: role of temperature, size and boundary walls., *Colloids and Surfaces A: Physicochemical and Engineering Aspects* (2014), http://dx.doi.org/10.1016/j.colsurfa.2014.05.078

Drainage of water droplets in a bounded paraffin oil continuous phase: role of temperature, size and boundary walls.

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Abstract

This article presents numerical simulations of the hydrodynamics generated by droplets evolving in a continuous paraffin oil phase and submitted to gravity. The model under consideration is two dimensional, includes capillarity, free boundaries and is simulated with a finite volume technique. Droplets are confined in a two dimensional simulation domain of 1 cm side. The influence of their size and temperature in their overall drainage dynamics is described. The initial condition problem is discussed for 1 mm radius droplets to describe the effect of boundary walls. Changes in the circulation flows are evidenced, different hydrodynamic regimes identified and their characteristic times discussed.

Keywords: Droplet hydrodynamics, Multiphase flows, Free interface systems, Capillarity.

Introduction

Computational techniques provide nowadays robust and stable algorithms for the simulation of two-phase systems involving free moving interfaces. Emulsions and dispersions are two typical examples of such systems. The understanding of the time evolution of two phase systems is fundamental in a large variety of research domains and industrial applications. The dispersion of two immiscible liquids is for example commonly found in chemical, pharmaceutical, oil and food industry [1-5]. The simulation of such free interface systems still raises important challenging issues in the field of applied mathematics and algorithmic developments. This is