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REVIEWS

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* In papers with more than one author, the asterisk indicates the name of the author to whom inquiries about the paper should be addressed.

ANNOUNCEMENT

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REVIEWS

Metering of Two-Phase Liquid–Liquid Emulsions: A State of the Art Review

Rajinder Pal

Department of Chemical Engineering, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1

Metering of two-phase liquid/liquid emulsions is important industrially. However, despite the industrial importance of the problem, this topic has received little attention in chemical engineering literature. This is the first comprehensive review of the topic. Following a brief discussion about the industrial applications of emulsions, the working principles of various emulsion metering techniques available to date, are discussed (albeit briefly). Where possible, the limitations of these techniques are pointed out. Various on-line techniques for calibrating the flowmeters (proving devices) are reviewed as well. The major drawback of the current literature is the general lack of experimental data available on metering of emulsions. Only a few emulsion metering techniques have been investigated in detail. In many cases, little or no experimental data are reported to test the full range of the applicability of the techniques. It is recommended that future research work should focus more on experimental evaluation of various techniques available so as to determine their full range of applicability and limitations. Experimental work dealing with comparisons of the various emulsion metering techniques will be most useful.

Contents

1. Introduction

1.1. Definition and Classification of Emulsions. An "emulsion" contains two liquid immiscible phases; one is dispersed as globules (droplets) in the other. The phase which is present in the form of globules is referred to as the "dispersed phase", and the phase which forms the matrix in which these globules are suspended is called the "continuous phase" (also referred to as external phase, dispersion medium, or suspending medium). The droplets of emulsions are generally larger than 0.5 μm in diameter so that they are visible under an optical microscope [*1*]. Stability to coalescence is achieved by the presence of an emulsifying agent which is adsorbed around the droplet surfaces.

Classification of Emulsions. Emulsions can be classified into three broad groups: (a) water-in-oil (designated as W/O) emulsions, (b) oil-in-water (designated as O/W) emulsions, and (c) multiple emulsions.

The water-in-oil emulsions consist of water droplets dispersed in a continuum of oil phase whereas the oil-in-water emulsions have a reverse arrangement; i.e., oil droplets are dispersed in a continuum of water phase. In the petroleum industry, water-in-oil emulsions are more commonly encountered and, therefore, the oil-in-water emulsions are usually called "reverse" emulsions, being the reverse of better known water-in-oil types.

Multiple emulsions consist of multiple droplets; for example, an O/W/O multiple emulsion consists of tiny oil

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