

## Accepted Manuscript

The effect of additional aeration of liquid on the atomization process for a pneumatic nebulizer

M. Ochowiak, M. Matuszak

PII: S0928-0987(16)30494-8  
DOI: doi: [10.1016/j.ejps.2016.11.015](https://doi.org/10.1016/j.ejps.2016.11.015)  
Reference: PHASCI 3801



To appear in:

Received date: 17 August 2016  
Revised date: 10 November 2016  
Accepted date: 11 November 2016

Please cite this article as: Ochowiak, M., Matuszak, M., The effect of additional aeration of liquid on the atomization process for a pneumatic nebulizer, (2016), doi: [10.1016/j.ejps.2016.11.015](https://doi.org/10.1016/j.ejps.2016.11.015)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# The effect of additional aeration of liquid on the atomization process for a pneumatic nebulizer

M. Ochowiak, M. Matuszak\*

*Faculty of Chemical Technology, Poznan University of Technology, 4 Berdychowo Street,  
60-965 Poznan, Poland*

## Abstract

At this paper the effect of aeration on the droplet size distribution of the aerosol have been analyzed. The atomization process was carried out using a pneumatic nebulizer which was equipped with a modified nebulizer cup. This modified nebulizer cup was combined with an additional source of gas bubbles. The measurements of the droplet sizes obtained by the use of the digital microphotography method and the analyzed by Image-Pro Plus software. The analysis of the experimental studies proved that an increase in the flow rates of additional gas leads to the increase in the number of small droplets and the decrease of the number of drops of large diameter. Additionally, the mean droplet diameter decreases with the increase of the flow rate of aeration gas. A correlation equation was proposed, which describes the relationship between the mean diameter of droplet and the volumetric flow rate of additional gas. The increase in the bubble volume discharging through a single orifice causes the increase of the flow rate of aeration gas. The modifications of construction of atomizer lead to the better effectiveness of nebulization.

*Keywords:* Aeration, Atomization, Pneumatic nebulizer, Drop size histogram, Mean droplet diameter

## 1. Introduction

Atomization of liquids is very important in many industrial processes (e.g. spray cooling, spray drying, preparation of fine powders, emulsions preparation) (Lefebvre, 1989, 1996; Liu, 2000; Crowe, 2006; Hede et al., 2008; Broniarz-Press et al., 2010; Schlender et al., 2015). The effervescent atomization is one of a method of twin-fluid atomization with internal mixing, wherein liquid and gas are mixed before they are discharged. This method is based on

---

\* Corresponding author. Tel.: +48 61 6652157.

*E-mail address:* [Magdalena.p.Markuszevska@doctorate.put.poznan.pl](mailto:Magdalena.p.Markuszevska@doctorate.put.poznan.pl); [magda.markus@gmail.com](mailto:magda.markus@gmail.com)

Present address: Poznan University of Technology, Department of Chemical Engineering and Equipment, 4 Berdychowo Street, PL 60-965 Poznan, Poland

Download English Version:

<https://daneshyari.com/en/article/5547982>

Download Persian Version:

<https://daneshyari.com/article/5547982>

[Daneshyari.com](https://daneshyari.com)