

Volume 1927

 **Conference collection**

# The 1<sup>st</sup> International Conference and Exhibition on Powder Technology Indonesia (ICePTi) 2017



**Jatinangor, Indonesia**  
8-9 August 2017

**Editors**

I Made Joni and Camellia Panatarani

**AIP** | Conference Proceedings

[proceedings.aip.org](http://proceedings.aip.org)

## Editors

### I Made Joni

#### Camellia Panatarani

Universitas Padjadjaran  
Department of Physics  
Faculty of Mathematics and Natural Sciences  
Jl. Raya Bandung-Sumedang KM 21  
Jatinangor, West Java 45363  
Indonesia

Universitas Padjadjaran  
Nanotechnology and Graphene Research Center  
Jl. Raya Bandung-Sumedang KM 21  
Jatinangor, West Java 45363  
Indonesia

Email: imadejoni@phys.unpad.ac.id  
c.panatarani@phys.unpad.ac.id

Authorization to photocopy items for internal or personal use, beyond the free copying permitted under the 1978 U.S. Copyright Law (see statement below), is granted by the AIP Publishing LLC for users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$30.00 per copy is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923, USA: <http://www.copyright.com>. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. The fee code for users of the Transactional Reporting Services is: 978-0-7354-1619-2/18/\$30.00



© 2018 AIP Publishing LLC

No claim is made to original U.S. Government works.

Permission is granted to quote from the AIP Conference Proceedings with the customary acknowledgment of the source. Republication of an article or portions thereof (e.g., extensive excerpts, figures, tables, etc.) in original form or in translation, as well as other types of reuse (e.g., in course packs) require formal permission from AIP Publishing and may be subject to fees. As a courtesy, the author of the original proceedings article should be informed of any request for republication/reuse. Permission may be obtained online using RightsLink. Locate the article online at <http://proceedings.aip.org>, then simply click on the RightsLink icon/"Permissions/Reprints" link found in the article abstract. You may also address requests to: AIP Publishing Office of Rights and Permissions, 1305 Walt Whitman Road, Suite 300, Melville, NY 11747-4300, USA; Fax: 516-576-2450; Tel.: 516-576-2268; E-mail: [rights@aip.org](mailto:rights@aip.org).

ISBN 978-0-7354-1619-2  
ISSN 0094-243X  
Printed in the United States of America

<b>Development and performance evaluation of air fine bubbles on water quality of thai catfish rearing</b> Ujang Subhan, Vanitha Muthukannan, Sundoro Yoga Azhary, Muhammad Fakhri Mulhadi, Emma Rochima, Camellia Panatarani, and I Made Joni	030043
<b>Fabrication and characterization of rice husk charcoal bio briquettes</b> S. Suryaningsih, O. Nurhilal, Y. Yuliah, and E. Salsabila	030044
<b>Application of probiotics and different size of sodium bicarbonate powders for feedlot sheep fattening</b> Hery Supratman, Diky Ramdani, SONDY Kuswaryan, Dwi Cipto Budinuryanto, and I Made Joni	030045
<b>The toxicity evaluation of prepared <i>Lantana camara</i> nano extract against <i>Spodoptera litura</i> (Lepidoptera: Noctuidae)</b> Hikmat Kasmara, Melanie, Dea Audia Nurfajri, Wawan Hermawan, and Camellia Panatarani	030046
<b>Surface wettability and subcooling on nucleate pool boiling heat transfer</b> Bambang Joko Suroto, Masamichi Kohno, and Yasuyuki Takata	030047

# Development and Performance Evaluation of Air Fine Bubbles on Water Quality of Thai Catfish Rearing

Ujang Subhan<sup>1, 4, a)</sup>, Vanitha Muthukannan<sup>4, b)</sup>, Sundoro Yoga Azhary<sup>4, c)</sup>,  
Muhammad Fakhri Mulhadi<sup>3, d)</sup>, Emma Rochima<sup>2, 4, e)</sup>, Camellia Panatarani<sup>3, 4, f)</sup>  
and I Made Joni<sup>3, 4, g)</sup>

<sup>1</sup>Dept. of Aquaculture, Faculty of Fishery and Marine Science, Universitas Padjadjaran,

<sup>2</sup>Dept. of Fishery Processing Technology, Faculty of Fishery and Marine Science, Universitas Padjadjaran,

<sup>3</sup>Dept. of Physics, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran,

<sup>4</sup>Nanotechnology and Graphene Research Center, Universitas Padjadjaran,

Jl. Raya Bandung-Sumedang KM 21, Jatininggor, West Java 45363, Indonesia

<sup>g)</sup>Corresponding author: imadejoni@phys.unpad.ac.id

<sup>a)</sup>ujang.subhan@unpad.ac.id, <sup>b)</sup>vanithachel@gmail.com, <sup>c)</sup>sundoroy@gmail.com,

<sup>d)</sup>muhammadfakhrimulhadi@gmail.com, <sup>e)</sup>emma.rochima@unpad.ac.id, <sup>f)</sup>c.panatarani@phys.unpad.ac.id

**Abstract.** The efficiency and productivity of aquaculture strongly depends on the development of advanced technology for water quality management system. The most important factor for the success of intensive aquaculture system is controlling the water quality of fish rearing media. This paper reports the design of fine bubbles (FBs) generator and performance evaluation of the system to improve water quality in thai catfish media (10 g/ind) with density (16.66 ind./L). The FBs generator was designed to control the size distribution of bubble by controlling its air flow rate entry to the mixing chamber of the generator. The performance of the system was evaluated based on the produced debit, dissolved oxygen rate and ammonia content in the catfish medium. The size distribution was observed by using a high speed camera image followed by processing using ImageJ. freeware application. The results show that air flow rate 0.05 L/min and 0.1 L/min received average bubble size of 29  $\mu\text{m}$  and 31  $\mu\text{m}$  respectively. The generator produced bubbles with capacity of 6 L/min and dissolved oxygen rate 0.2 ppm/min/L. The obtained DO growth was 0.455 ppm/second/L while the average decay rate was 0.20 ppm/second/L. (0.011/0.005 fold). In contrast, the received DO growth rate is faster compared to the DO consumption rate of the Thai catfish. This results indicated that the potential application of FBs enhanced the density of thai catfish seed rearing. In addition, ammonia can be reduced at 0.0358 ppm/hour/L and it is also observed that the inhibition of bacterial growth of air FBs is positive to *Aeromonas hydrophila* bacteria compared to the negative control. It is concluded that as-developed FBs system can be potentially applied for intensive thai catfish culture and expected to improve the feeding efficiency rate.

## INTRODUCTION

Fine bubbles are applied in many research areas such as water treatment [1], minerals and bioresources recovery [2,3], washing processes [4] and aquaculture engineering, because of their large surface area and longer residence time in liquid. Also, fine bubbles are expected to provide different physicochemical and fluid dynamics properties than macro-bubbles. The efficiency and productivity of aquaculture strongly depend on the development of advanced technology for water quality management system i.e. controlling the water quality of fish rearing medium. A pressurized dissolution method based on decompression of liquid with dissolved gas (either air or pure O<sub>2</sub>) is one of promising methods for generating fine bubbles with high number density. Among many characteristics of the FBs, ability to achieve high dissolved oxygen (DO) and ability to reduce ammonia content are most important for aquaculture systems.

Catfish (*Pangasianodon hypophthalmus*) is one of the Indonesian prominent fish from the fishery industries and a good prospective product for international trade. The production rate of catfish in 2015 counted since first until third quarter was 11.53% [5]. It is expected that the increment in the production rate is able to fulfill the very high domestic needs, especially in fishery processing industry. By 2012, Indonesia imported 1,300 tons of