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Ferro9

Proceedings of the
9th International Symposium on
Ferrocement
and Thin Reinforced Cement Composites



Green Technology for Housing
and Infrastructure Construction

May 18-20 2009, Bali-Indonesia

Edited By

Anshori Djausal
University of Lampung

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PROCEEDINGS

9TH INTERNATIONAL SYMPOSIUM ON FERROCEMENT AND THIN REINFORCED CEMENT COMPOSITES: GREEN TECHNOLOGY FOR HOUSING AND INFRASTRUCTURE CONSTRUCTION

Bali, May 18 – 20, 2009

Edited by:

**ANSHORI DJAUSAL
FIKRI ALAMI
ANTOINE E. NAMAN**



**THE UNIVERSITY OF LAMPUNG
BANDAR LAMPUNG, INDONESIA**

ISBN: 978-979-1165-93-8

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CEMENT COMPOSITES: GREEN
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BANDAR LAMPUNG, INDONESIA**
May 2009

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Preface

Ferrocement and thin reinforced cement composites are essentially reinforced concrete products having less than about 50 mm in thickness. As such their reinforcement is subjected to dimensional scale constraints such as using a steel wire mesh versus a steel reinforcing bar, or mortar instead of concrete. Their applications are extensive in housing, agricultural structures, marine structures, and in repair-rehabilitation.

Over the course of the last five decades which mark the modern use of ferrocement and thin reinforced cement composites, their analysis, design, and manufacturing were the subject of remarkable advances; these include advances in: 1) the reinforcement, such as high strength steel, advanced fiber reinforced polymeric reinforcements, 2D and 3D textiles, etc, 2) the cementitious matrix, such as high strength or high performance, high durability, lightweight, blended with supplemental materials, additives, self consolidation, ultra high strength, etc., 3) the concept of hybridization such as adding fibers and microfibers to supplement conventional reinforcement, and 4) the manufacturing process ranging from simple plastering to infiltration, extrusion, pultrusion, and the like.

The main objectives of this symposium are: to provide a compendium of up-to-date information on the latest development and research advances in the field of ferrocement and thin reinforced cement composites; to allow a forum of world specialists to share their knowledge, experience and vision; to foster collaboration and technical exchanges between researchers and practitioners nationally and internationally; to identify current technical gaps as well as immediate research needs; and to suggest directions to follow. This symposium attempted in particular to encourage contributions addressing green technology for housing and infrastructure applications.

Thin cementitious composites reinforced with steel wire mesh traditionally belong to the ferrocement family. The use of textiles or fabrics made of high performance fiber reinforced polymeric (FRP) meshes adds another dimension to the traditional ferrocement family. Thus ferrocement should, from now on, encompass the term thin textile reinforced concrete (TRC). The possible addition of discontinuous fibers or micro-fibers to the cement

matrix and new availability of three-dimensional textiles adapted for cement based applications offer unique opportunities for future developments and growth. It is one of the particular objectives of this symposium to illustrate the use of 2D and 3D textiles or fabrics, although they are still in their early development.

Another particular objective of this symposium is related to education. The development of sustainable, humane, safe housing and infrastructure for developing regions of the world is one of the grand challenges facing society, in which civil engineers should have a prominent role. Educating civil engineering students and professionals in the concept, science and technology of ferrocement and thin reinforced cement composites offers one important opportunity to meet this growing challenge.

Although, in the call for papers for this symposium, various themes were sought the final papers received were grouped according to several themes: 1) Applications in Housing and Related Structures; 2) Structural Strengthening Using Ferrocement; 3) Analysis, Modeling and Simulation; 4) Textiles, FRP, and Natural Reinforcements; 5) Durability and Structural Performance; and 6) Non-Traditional Materials and Applications.

We would like to take this opportunity to thank the authors who made this publication possible, members of the International, Scientific, and Local Organizing Committees, and the many organizations who have co-sponsored this symposium.

A. Djausal, F. Alami and A.E. Naaman
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Acknowledgments

This symposium was made possible by the combined efforts of a number of people and organizations who believe in the benefits of ferrocement as a green technology for numerous construction applications. We would like to acknowledge, with sincere thanks and gratitude, the support of the following organizations:

Lampung Province:

- Government of Lampung Province
- Kabupaten Wan Kanan
- City of Metro
- Kabupaten of Tulang Bawang
- Office of National Education
- Office of Public Works

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- Faculty of Engineering
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- Directorate General of Marketing, Department of Culture and Tourism

Event Organizer: PACTO Convex, Ltd. (I.M. Suardana)

Cover Designer: Dedi Iswanto

We would also like to express our deepest gratitude to the following students and faculty from the University of Lampung, Civil Engineering Department, who have provided their time and utmost dedication to help in the production details of these proceedings, in record time: Hasti Riakara Husni, Bayzoni, Ika Kustani, Achmad Farouk, Mohd Isneini, Masdar Helmi, Febry Pernata, and Andius Dasa Putra.

A. Djausal, F. Alami and A.E. Naaman
Editors

Rector's Editorial

To have as ideal Unila becomes one out best ten universities in Indonesia, Unila is making every effort to carry out missions such as implementing collaborations with many parties. It is hope that these collaborations are for the benefits and sustainability of Unila.

The execution of routine meetings among construction's researchers and practitioners in the format of "9th International Symposium on Ferrocement and Thin Reinforced Cement Composites (Ferro-9th) on 18 to 22 May 2009 in Bali is one of Unila's international collaboration effort that represented by the Faculty of Engineering. This symposium is collaboration between The Faculty of Engineering with the International Ferrocement Society (IFS) that gathers the ferrocement scientists from many leading universities all over the world.

It is hope that this symposium could disseminate up to date information on ferrocement construction and could benefit all parties improving partnership among universities.

This symposium is done well because of support from many parties. I thank all the parties that had helped and collaborated for the successful of the symposium.

May 2009
Prof. Dr. Ir. Sugeng P. Harianto, M.S

