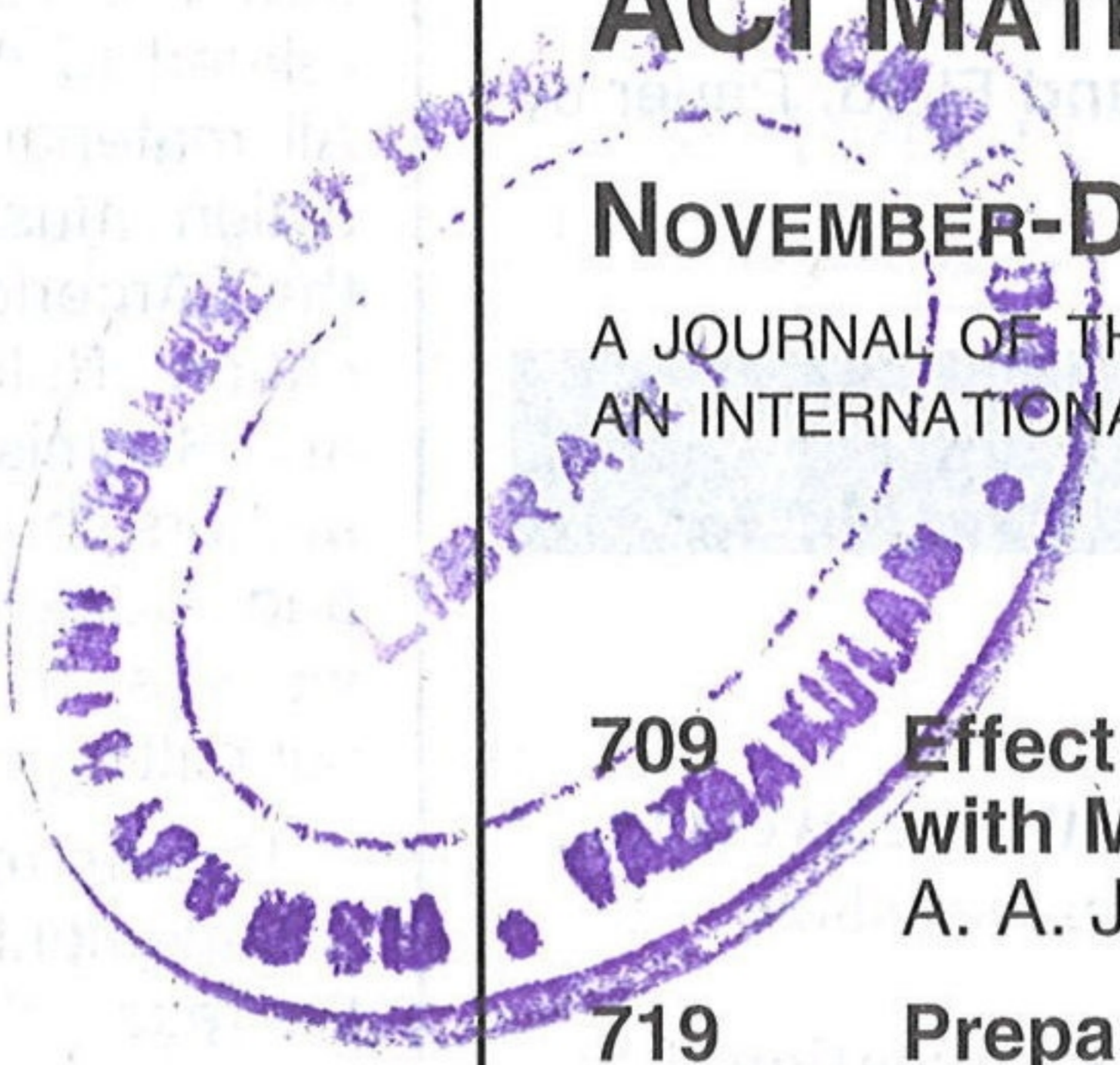


ACI MATERIALS JOURNAL

NOVEMBER-DECEMBER 2016, V. 113, No. 6

A JOURNAL OF THE AMERICAN CONCRETE INSTITUTE
AN INTERNATIONAL TECHNICAL SOCIETY

31
277



Board of Direction

President

Michael J. Schneider

Vice Presidents

Khaled Awad
David A. Lange

Directors

JoAnn P. Browning
Cesar A. Constantino
Alejandro Durán-Herrera
R. Doug Hooton
Frances T. Griffith
Augusto H. Holmberg
Kimberly Kayler
Neven Krstulovic-Opara
Fred Meyer
Antonio Nanni
Michael M. Sprinkel
Roberto Stark

Past President Board Members

Sharon L. Wood
William E. Rushing Jr.
Anne M. Ellis

Executive Vice President

Ron Burg

Technical Activities Committee

Trey Hamilton III, Chair
Matthew R. Senecal, Secretary
Michael C. Brown
JoAnn P. Browning
Catherine E. French
Harry A. Gleich
Fred R. Goodwin
Larry Kahn
Neven Krstulovic-Opara
Kimberly Kurtis
Tracy D. Marcotte
Michael Stenko
Bruce A. Suprenant
Andrew W. Taylor

Staff

Executive Vice President
Ron Burg

Engineering

Managing Director
Michael L. Tholen

Managing Editor
Jerzy Z. Zemajtis

Staff Engineers
Khaled Nahlawi
Matthew R. Senecal
Gregory M. Zeisler

Publishing Services

Manager
Barry M. Bergin

Editors
Carl R. Bischof
Tiesha Elam
Kaitlyn J. Hinman
Kelli R. Slayden

Editorial Assistant
Angela R. Matthews

- 709 **Effect of Cement on Mechanical Behavior of Soil Contaminated with Monoethylene Glycol (MEG)**, by A. R. Estabragh, M. Khatibi, and A. A. Javadi
- 719 **Preparation and Processability of Light-Transmitting Magnesians Cementitious Materials**, by Fazhou Wang, Chang Shu, Dingheng Zheng, Lu Yang, and Peng Liu
- 725 **Impact Resistance and Acoustic Absorption Capacity of Self-Consolidating Rubberized Concrete**, by Mohamed K. Ismail and Assem A. A. Hassan
- 737 **Damage Progression in Concrete Using Acoustic Emission Test through Convex Hull Visualization**, by Jason Maximino C. Ongpeng, Andres Winston C. Oreta, and Sohichi Hirose
- 745 **High-Strength, Cement-Free Concrete of Flue Gas Desulfurization Gypsum-Based Non-Fired Brick**, by Dongxue Yu, Jun Zhou, Zhu Shu, and Yanxin Wang
- 753 **Forced Bleeding Test to Assess Stability of Flowable Concrete**, by Yannick Vanhove and Kamal Henri Khayat
- 759 **Effects of Air Void Clustering on Concrete Compressive Strength**, by Jan Vosahlik, Kyle A. Riding, Asad Esmaeily, Randall Billinger, and Heather McLeod
- 769 **Microstructural Analyses of Recycled Aggregate-Bearing Mortar Mixture**, by Ali Mardani-Aghabaglou, Ahsanollah Beglarigale, Halit Yazıcı, and Kambiz Ramyar
- 781 **Neural Network, Machine Learning, and Evolutionary Approaches for Concrete Material Characterization**, by Mohammad H. Rafiee, Waleed H. Khushefati, Ramazan Demirboga, and Hojjat Adeli
- 791 **Physical and Chemical Actions of Nano-Mineral Additives on Properties of High-Volume Fly Ash Engineered Cementitious Composites**, by Y. Al-Najjar, S. Yeşilmen, A. Majeed Al-Dahawi, M. Şahmaran, G. Yıldırım, M. Lachemi, and L. Amleh
- 803 **Low-Cycle Fatigue Performance of High-Strength Steel Reinforcing Bars**, by Wassim M. Ghannoum and Chase M. Slavin
- 815 **Steam Curing Influence on Fly Ash High-Performance Recycled Concrete**, by Andreu Gonzalez-Corominas, Miren Etxeberria, and Anna Galindo
- 827 **CAPO-TEST to Estimate Concrete Strength in Bridges**, by Andrzej T. Moczko, Nicholas J. Carino, and Claus Germann Petersen

Contents cont. on next page

Discussion is welcomed for all materials published in this issue and will appear ten months from this journal's date if the discussion is received within four months of the paper's print publication. Discussion of material received after specified dates will be considered individually for publication or private response. ACI Standards published in ACI Journals for public comment have discussion due dates printed with the Standard.

ACI Materials Journal
Copyright © 2016 American Concrete Institute. Printed in the United States of America.

The *ACI Materials Journal* (ISSN 0889-325x) is published bimonthly by the American Concrete Institute. Publication office: 38800 Country Club Drive, Farmington Hills, MI 48331. Periodicals postage paid at Farmington, MI, and at additional mailing offices. Subscription rates: \$166 per year (U.S. and possessions), \$175 (elsewhere), payable in advance. POSTMASTER: Send address changes to: *ACI Materials Journal*, 38800 Country Club Drive, Farmington Hills, MI 48331.

Canadian GST: R 1226213149.

Direct correspondence to 38800 Country Club Drive, Farmington Hills, MI 48331. Telephone: +1.248.848.3700.
Website: <http://www.concrete.org>.



837 **Time-Dependent Diffusion Modeling of Concrete with Cement Containing Limestone and Inorganic Process Additions**, by Mustapha A. Ibrahim and Mohsen A. Issa

849 **Discussion**

Early-Age Stiffening of Paste, Mortar, and Concrete in Lab and Field. Paper by Chang Hoon Lee and Kenneth Hover

Contributions to *ACI Materials Journal*

The *ACI Materials Journal* is an open forum on concrete technology and papers related to this field are always welcome. All material submitted for possible publication must meet the requirements of the "American Concrete Institute Publication Policy" and "Author Guidelines and Submission Procedures." Prospective authors should request a copy of the Policy and Guidelines from ACI or visit ACI's website at www.concrete.org prior to submitting contributions.

Papers reporting research must include a statement indicating the significance of the research.

The Institute reserves the right to return, without review, contributions not meeting the requirements of the Publication Policy.

All materials conforming to the Policy requirements will be reviewed for editorial quality and technical content, and every effort will be made to put all acceptable papers into the information channel. However, potentially good papers may be returned to authors when it is not possible to publish them in a reasonable time.

Discussion

All technical material appearing in the *ACI Materials Journal* may be discussed. If the deadline indicated on the contents page is observed, discussion can appear in the designated issue. Discussion should be complete and ready for publication, including finished, reproducible illustrations. Discussion must be confined to the scope of the paper and meet the ACI Publication Policy.

Follow the style of the current issue. Be brief—1800 words of double spaced, typewritten copy, including illustrations and tables, is maximum. Count illustrations and tables as 300 words each and submit them on individual sheets. As an approximation, 1 page of text is about 300 words. Submit one original typescript on 8-1/2 x 11 plain white paper, use 1 in. margins, and include two good quality copies of the entire discussion. References should be complete. Do not repeat references cited in original paper; cite them by original number. Closures responding to a single discussion should not exceed 1800-word equivalents in length, and to multiple discussions, approximately one half of the combined lengths of all discussions. Closures are published together with the discussions.

Discuss the paper, not some new or outside work on the same subject. Use references wherever possible instead of repeating available information.

Discussion offered for publication should offer some benefit to the general reader. Discussion which does not meet this requirement will be returned or referred to the author for private reply.

Send manuscripts to:
<http://mc.manuscriptcentral.com/aci>

Send discussions to:
Journals.manuscripts@concrete.org

MEETINGS

JANUARY 2017

8-12—**Transportation Research Board (TRB) 96th Annual Meeting**, Washington, DC, www.trb.org/AnnualMeeting/AnnualMeeting.aspx

9-12—**Building Innovation 2017**, Washington, DC, <http://www.nibs.org/?conference2017>

10-12—**2017 NAHB International Builders' Show®**, Orlando, FL, www.buildersshow.com

17-20—**2017 World of Concrete**, Las Vegas, NV, <https://worldofconcrete.com>

FEBRUARY 2017

14-17—**2017 ICPI Annual Meeting**, Phoenix, AZ, www.icpi.org/2017AnnualMeeting

18-19—**2017 ICON-Xchange**, Phoenix, AZ, <http://iconxchange.org/2017>

20-22—**NCMA Annual Convention**, Phoenix, AZ, <http://iconxchange.org/2017/annual-convention>

23-24—**SDC Technology Forum 41**, Dallas, TX, http://concretesdc.org/meetings/session41/SDC41_generalinfo.htm

MARCH 2017

2-4—**The Precast Show 2017**, Cleveland, OH, <http://precast.org/theprecastshow>

4-6—**NRMCA's Annual Convention**, Las Vegas, NV, www.nrmca.org/Conferences_Events/AnnualConvention/2017/index.html

6-8—**Eleventh High-Performance Concrete (11th HPC) and the Second Concrete Innovation Conference (2nd CIC)**, Tromsø, Norway, www.tekna.no/en/events/hpccic-tromso-2017-32076

7-11—**CONEXPO-CON/AGG 2017**, Las Vegas, NV, www.conexpoconagg.com

12-15—**Geotechnical Frontiers 2017**, Orlando, FL, <http://geotechnicalfrontiers.com>

14-18—**45th CSDA Annual Convention & Tech Fair**, Rio Grande, Puerto Rico, www.csda.org/?page=Convention2017

15-17—**ICRI 2017 Spring Convention**, Montreal, QC, Canada, www.icri.org/event/2017_SpringConvention

MARCH-APRIL 2017

29-1—**13th International Workshop on Micropiles**, Vancouver, BC, Canada, www.ismicropiles.org

THE ACI CONCRETE CONVENTION AND EXPOSITION: FUTURE DATES

2017—March 26-30, Detroit Marriott at the Renaissance Center, Detroit, MI

2017—October 15-19, Disneyland Hotel, Anaheim, CA

2018—March 25-29, Grand America & Little America, Salt Lake City, UT

For additional information, contact:

Event Services, ACI
38800 Country Club Drive
Farmington Hills, MI 48331
Telephone: +1.248.848.3795
e-mail: conventions@concrete.org

ON COVER: 113-M67, p. 742, Fig. 10—Volume of convex hull for fiber-reinforced concrete specimen. (Note: 1 in. = 2.54 cm; 1 in.³ = 16.39 cm³.)

Permission is granted by the American Concrete Institute for libraries and other users registered with the Copyright Clearance Center (CCC) to photocopy any article contained herein for a fee of \$3.00 per copy of the article. Payments should be sent directly to the Copyright Clearance Center, 21 Congress Street, Salem, MA 01970. ISSN 0889-3241/98 \$3.00. Copying done for other than personal or internal reference use without the express written permission of the American Concrete Institute is prohibited. Requests for special permission or bulk copying should be addressed to the Managing Editor, *ACI Materials Journal*, American Concrete Institute.

The Institute is not responsible for statements or opinions expressed in its publications. Institute publications are not able to, nor intend to, supplant individual training, responsibility, or judgment of the user, or the supplier, of the information presented.

Papers appearing in the *ACI Materials Journal* are reviewed according to the Institute's Publication Policy by individuals expert in the subject area of the papers.