

Chunyu (Joe) Qiao, PhD

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Education

Ph.D. (Mineral Processing Engineering), University of Science and Technology Beijing (Beijing, China) 9/2011-1/2016
Joint Ph.D. program in Civil engineering (advisor: Dr. Jason Weiss), Purdue University, West Lafayette 9/2013-9/2015
B. Engineering (Geological Engineering), Central South University (Changsha, China) 9/2007-6/2011

Work Experience

Chief Scientist, DRP, A Twining Company 2/2021-present
Senior Petrographer, DRP, A Twining Company 7/2018-2/2021
Postdoctoral Scholar (Civil engineering; advisor: Dr. Jason Weiss), Oregon State University 4/2016-7/2018

Membership of International Organizations

American Concrete Institute (ACI):

Associate member of Committee 201 (Durability), 350 (Environmental structures) and 365 (Service life);

International Union of Laboratories and Experts in Construction Materials, Systems and Structures (RILEM):

Technical Committee member of EBD: Test methods to evaluate durability of blended cement pastes against deleterious ions.

Research Metrics

Citation metrics:

Google Scholar: 423 (h-index: 12; i10-index: 17);
CNKI: 178;
Google and CNKI combined: 543 (duplicates removed)
ResearchGate Score: 22.34

Experience to journal editorial board including:

Junior Editorial Board Member: *Journal of Infrastructure Preservation and Resilience*

Experience to peer review research manuscripts for SCI journals (60+ times) including:

Journal of Cleaner Production;
Construction and Building Materials;
Materials and Structures;
ACI Materials Journal;
ASCE Journal of Materials in Civil Engineering;
Advances in Civil Engineering Materials;
Sustainability and etc.

Research Expertise and Interests

Research interests --- Cementitious Materials and Infrastructure Concrete Durability

1. Diagnosis and prognosis of infrastructure concrete regarding troubleshooting, repair, preservation using concrete petrography;
2. Microstructure of construction materials and image analysis;
3. Chemical attack (calcium oxychloride, calcium leaching and etc.) of deicing salts on cementitious materials;
4. Chemical admixtures (PCM, SRA and etc.)
5. Transport properties of concrete (moisture transport, chloride ingress, and etc.)
6. Service life prediction under frost attack/chloride ingress

7. Supplementary cementitious materials and green construction materials (fly ash, slag, ore tailings, and waste rocks).

Selected Research Projects:

1. “Key technologies and applications of environmentally friendly innovative building materials prepared by ore tailings” (Chinese national research project, 2012AA062405, 2012-2016):
2. “Improving Specifications to Resist Frost Damage in Modern Concrete”, pooled fund by Oklahoma Department of Transportation (TP-5(297), 2016-2018):
3. “The Use of Microsphere-Based Technology for Freeze-Thaw Durability”, funded by BASF Inc. (2017-2018):
4. “Performance based mixture design for concrete pavement”, pooled funded by Federal Highway Administration (FHWA) (2016-2018):
5. MIT CSHub project (2017-2018):
6. Summer undergraduate research funding (SURF, 6/2017-8/2017)

Selected Industrial Projects:

I have completed diagnosis and consultations on 50+ domestic and international infrastructure projects using multiple lab tools since 2018, such as:

1. Arlington Memorial Bridge in D.C.;
2. Shasta Dam in California;
3. Pearl Harbor Battleship Row Fleet Moorings in Hawaii;
4. Denver International Airport and etc.

Selected peer-reviewed papers (29)

1. C. Qiao, X. Chen, P. Suraneni, W. J. Weiss, D. Rothstein. Petrographic analysis of in-service cementitious mortar substrate subject to freeze-thaw cycles coupled with deicing salts. *Cement and Concrete Composites*, under minor revision.
2. C. Qiao, N. Hosseinzadeh, P. Suraneni, S. Wei, D. Rothstein. Petrographically quantifying the damage to field and lab-cast mortars subject to freeze-thaw cycles and deicer application. *Journal of Infrastructure Preservation and Resilience*, Accepted (2021).
3. H. Zhao, X. Li, X. Chen, C. Qiao, W. Xu, P. Wang, H. Song. Microstructure evolution of cement mortar containing MgO-CaO blended expansive agent and temperature rising inhibitor under multiple curing temperatures. *Construction and Building Materials*, 278 (2021).
4. Y. Li, C. Qiao, W. Ni. Mechanical properties and hydration of green concrete with electric arc furnace reducing slag. *Journal of Cleaner Production*, 2020.
5. M. Khanzadeh Moradllo, C. Qiao, R. Maria Ghantous, M. Zaw, H. Hope, M.T. Ley, W.J. Weiss. Quantifying the freeze-thaw performance of air-entrained concrete using the time to reach critical saturation modelling approach. *Cement and Concrete Composites*, 106 (2020).
6. C. Qiao, M. Khanzadeh Moradllo, H. Hall, M. T. Ley, W. J. Weiss. Electrical resistivity and formation factor of air-entrained concrete. *ACI Material Journal*, 116 (2019).
7. M. Khanzadeh Moradllo, C. Qiao, H. Hope, S. Reese, T. Ley, J. Weiss. Quantifying Fluid Filling of the Air Voids in Air Entrained Concrete Using Neutron Radiography. *Cement and Concrete Composites*, 104 (2019).
8. M. Khanzadeh Moradllo, C. Qiao, M. Keys, H. Hope, T. Ley, S. Reese, J. Weiss. Quantifying Fluid Absorption in Air-Entrained Concrete Using Neutron Radiography. *ACI Material Journal*, 116 (2019).
9. S. H. Smith, C. Qiao, P. Suraneni, K. Kurtis, W. J. Weiss. Service-life assessment of concrete in freeze-thaw environments: State of the art and future directions. *Cement and Concrete Research*, 122 (2019).
10. M. Tsui-Chang, C. Qiao, L. Montanari, P. Suraneni, J. Weiss. Chloride binding of cementitious materials exposed to sodium chloride using X-ray fluorescence. *ACI Materials Journal*, 116 (2019).
11. C. Qiao, N. W. Y. Then, P. Suraneni, A. Choudhary, W. J. Weiss. Chloride binding of cement pastes with fly ash exposed to CaCl₂ solutions at different temperatures. *Cement and Concrete Composites*, 97 (2019).

12. V. J. Azad, A.R. Erbehtas, C. Qiao, O. B. Isgor, W. J. Weiss. Relating the formation factor and chloride binding parameters to the apparent chloride diffusion coefficient of concrete. *Journal of Materials in Civil Engineering*, 31 (2019).
13. M. Khanzadeh Moradllo, C. Qiao, B. O. Isgor, D. Reese, J. Weiss. Relating the Formation Factor of Concrete to Water Absorption. *ACI Material Journal*, 115 (2018).
14. C. Qiao, P. Suraneni, J. Weiss. Damage in cement pastes exposed to MgCl₂ solutions. *Materials and Structures*, 51 (2018).
15. C. Qiao, P. Suraneni, J. Weiss. The Damage of Cementitious Materials Exposed to NaCl Solution. *Construction and Building Materials*, 171 (2018).
16. C. Qiao, A. Coyle, B. O. Isgor, J. Weiss. Prediction of chloride ingress in saturated concrete using formation factor and chloride binding isotherm. *Advances in Civil Engineering Materials*, 7 (2018).
17. C. Qiao, P. Suraneni, J. Weiss. Phase diagram and volume change of the Ca(OH)₂-CaCl₂-H₂O system for varying Ca(OH)₂/CaCl₂ molar ratios. *Journal of Materials in Civil Engineering*, 30 (2018).
18. C. Qiao, P. Suraneni, J. Weiss. Flexural strength reduction of cement pastes exposed to CaCl₂ solutions. *Cement and Concrete Composites*, 87 (2018).
19. C. Qiao, W. Ni, J. Weiss. Chloride diffusion and wicking in concrete exposed to NaCl and MgCl₂ solutions. *Journal of Materials in Civil Engineering*, 30 (2018).
20. C. Qiao, P. Suraneni, J. Weiss. Measuring volume change caused by calcium oxychloride phase transformation in a Ca(OH)₂-CaCl₂-H₂O system. *Advances in Civil Engineering Materials*, 6 (2017).
21. C. Qiao, W. Ni, J. Weiss. Transport due to diffusion, drying, and wicking in concrete containing a shrinkage-reducing admixture. *Journal of Materials in Civil Engineering*, 29 (2017)
22. W.J. Weiss, T.J. Barrett, C. Qiao, H. Todak. Towards a specification for transport properties of concrete based on the formation factor of a sealed specimen. *Advances in Civil Engineering Materials*, 5 (2016).
23. C. Qiao, W. Ni, C. Wang. Hydration and mechanical properties of cement-based materials with high use level of metakaolin. *Journal of Building Materials*, 18 (2015). (in Chinese)
24. C. Qiao, W. Ni, C. Wang. Properties and microstructure of metakaolin (MK)-cement hardened slurry with high use level of MK. *Journal of Building Materials*, 18 (2015). (in Chinese)
25. C. Qiao, W. Ni, C. Wang. Autoclaving reaction activity of four kinds of silicate minerals. *Journal of University of Science and Technology Beijing*, 36 (2014). (in Chinese)
26. C. Wang, S. Wang, C. Qiao, W. Ni, C. Xu, X. Qiu, S. Ping. Effect of coal types on iron recovery from iron ore tailings with high iron silicate by deep reduction process. *Transactions of Materials and Heat Treatments*, 35 (2014). (in Chinese)
27. C. Wang, C. Qiao, S. Wang, W. Ni, H. Wu, X. Qiu. Experimental study on autoclaved aerated concrete from coal gangue and iron ore tailings. *Journal of the China Coal Society*, 39 (2014). (in Chinese)
28. C. Wang, W. Ni, C. Qiao, S. Wang, H. Wu, Y. Li. Autoclaved aerated concrete prepared with iron ore tailings as siliceous materials. *Transactions of Materials and Heat Treatment*, 34 (2013). (in Chinese)
29. C. Wang, W. Ni, C. Qiao, S. Wang, H. Wu, Y. Li. Preparation and properties of autoclaved aerated concrete using iron ore tailings. *Chinese Journal of Materials Research*, 27 (2013). (in Chinese)

U.S. Government sponsored technical reports (4)

1. R. Pellenq, M. Bazant, A. Dufresne, R. Dupuis, J. Gregory, K. Ioannidou, S. Yip, T. Zhou, J. Weiss, R. Ghantous, J. Ideker, C. Qiao, P. Suraneni, M. Thomas, T. Moffatt, A. Jack, M. Haist, F. Rajabipour, L. Béland, L. Barcelo, M. B. Haha, C. Lobo, N. Popoff, P. Tennis, S. Tritsch. A Scientific Investigation into Concrete Pavement Durability. *Sponsoring Agency: the Portland Cement Association and the Ready Mixed Concrete Research and Education Foundation.*
2. W.J. Weiss, J. Olek, N.M. Whiting, P. Panchamatia, C. Qiao, P. Suraneni. Synthesis Accelerating Implementation of Research Findings to Reduce Potential Concrete Pavement Joint Deterioration. Report No.: FHWA/IN/JTRP-2018/24 (2018). *Sponsoring Agency: Indiana Department of Transportation.*

3. W.J. Weiss, M. Tsui-Chang, L. Montanari, P. Panchamatia, **C. Qiao**, P. Suraneni. Testing Procedures for the First Tier of Durability Specifications that will be compliant with the AASHTO Performance Engineered Concrete Pavement Mixtures (PEM) PP84-16 and Performance Related Specifications (PRS) for Use by FHWA at the Turner Fairbanks Highway Research Center (TFHRC), 2017. *Sponsoring Agency: AASHTO*.
4. W.J. Weiss, **C. Qiao**, B. Isgor, J. Olek. Implementing Rapid Durability Measure for Concrete Using Resistivity and Formation Factor. Report No.: FHWA/IN/JTRP-2020/08 (2020). *Sponsoring Agency: Indiana Department of Transportation*.

Granted patents as a co-inventor (3)

1. CN102617096(A) – Method for preparing aerated concrete by controlling iron direction using iron ore tailings. Inventors: W. Ni, C. Wang, H. Wu, D. Li, S. Wang, **C. Qiao**.
2. CN104876534(A) – Method for preparing autoclaved bricks from tungsten ore tailings and waste rocks. Inventors: C. Wang, X. Qiu, S. Wang, S. Gao, **C. Qiao**, X. Cui, Y. Di, C. Wang.
3. CN104876519(A) – Method for preparing autoclaved sand-lime brick from lead-zinc ore tailings and recycled concrete. Inventors: C. Wang, X. Qiu, S. Wang, S. Gao, **C. Qiao**, X. Cui, Y. Di, C. Wang.

Peer-reviewed conference papers (7)

1. **C. Qiao**, G. Gaines, B. Stein et al. Feasibility of using the electrical resistivity to measure damage from alkali-silica reaction, *16th International Conference on Alkali Aggregate Reaction in Concrete*, Lisbon, Portugal (2020)
2. **C. Qiao**, D. Rothstein. Microstructural evaluation of durability of different cementitious mixtures in microbial induced corrosion environments, *DBMC 2020 XV International Conference on Durability of Building Materials and Components*, Barcelona, Spain (2020)
3. **C. Qiao**, N.W.Y., Then, A. Choudhary, et al. Chloride binding considering the formation of calcium oxychloride in cement pastes containing fly ash exposed to CaCl₂ solutions at 5 and 23 °C, *SLD4 The 4th International Conference on Service Life Design for Infrastructures*, Delft, the Netherlands (2018)
4. P. Suraneni, **C. Qiao**, et al., A review of recent work on deicing salt damage to concrete pavements and its mitigation, *RILEM International Conference on Advances in Construction Materials and Systems*, Chennai (2017) – **Keynote lecture by J. Weiss**
5. **C. Qiao**, P. Suraneni, M. Tsui, J. Weiss. The influence of calcium chloride on flexural strength of cement-based materials, *fib Symposium*, Maastricht (2017)
6. **C. Qiao**, W. Ni, J. Weiss. Influence of Shrinkage Reducing Admixtures on Chloride Binding and Diffusion. *14th International Congress on the Chemistry of Cement*, Beijing (2015)
7. A. Miller, R. Spragg, F. C. Antico, et al. Determining the Moisture Content of Pre-Wetted Lightweight Aggregate: Assessing the Variability of the Paper Towel and Centrifuge Methods. *4th International Conference on the Durability of Concrete Structures*, West Lafayette, IN (2014)

Other publications (4)

1. D. Rothstein, and **C. Qiao**. Accelerated Expansion Test Sample Report: DRP, in Corrosion of Steel in Diagnosis & Prognosis of AAR Affected Structures: State-of-the-Art Report of the RILEM Technical Committee 259-ISR, 2020, RILEM. – **Book Chapter**
2. **C. Qiao**, et al., The CaCl₂-H₂O-Ca(OH)₂ phase diagram and its importance in infrastructure durability, 3rd Corvallis Workshop Proceedings (2017). – **Conference proceedings**
3. R. Spragg, **C. Qiao**, T. Barrett, J. Weiss. Accessing a concrete's resistance to chloride ion ingress using the formation factor, in Corrosion of Steel in Concrete Structures, 2016, Woodhead Publishing. – **Book Chapter**
4. **C. Qiao**, P. Suraneni, M. Tsui Chang, J. Weiss (2018), The Influence of Calcium Chloride on Flexural Strength of Cement-Based Materials. In: Hordijk D., Luković M. (eds) High Tech Concrete: Where Technology and Engineering Meet. Springer, Cham – **Conference proceedings**

International conference presentation (6)

1. **C. Qiao**, P. Suraneni, J. Weiss. Salt damage and freeze-thaw damage in cementitious materials exposed to deicers. *American Concrete Institute 2018 Spring Convention*, Utah (2018).
2. **C. Qiao**. The damage in cement pastes exposed to Cl based deicer solutions. *Invited presentation in University of Miami*, Florida (2017).
3. **C. Qiao**, J. Weiss. Test Development, Service Life Prediction Models and Specifications. *Anna Maria Workshop XVII*, Florida (2017).
4. **C. Qiao**, P. Suraneni, J. Weiss. The damage in cement pastes exposed to NaCl and CaCl₂ solutions. *Anna Maria Workshop XVII*, Florida (2017).
5. **C. Qiao**, P. Suraneni, J. Weiss. The volume change and damage in cement paste exposed to CaCl₂ solution. *8th Advances in Cement-Based Materials (Cements 2017)*, Atlanta (2017).
6. **C. Qiao**, W. Ni, J. Weiss. Influence of Shrinkage Reducing Admixtures on Chloride Binding and Diffusion. *14th International Congress on the Chemistry of Cement*, Beijing (2015)