

# UPDATES TO THE ACI 201.1R CHAPTER ON AGGREGATE REACTIONS AND SESSION INTRODUCTION

**Matthew P. Adams**

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New Jersey Institute of Technology



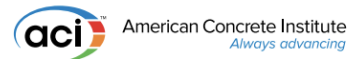
ACI Convention  
Recent Developments in Test Methods and Risk Management  
For Aggregate Reactions, Part 1  
1 November 2023

# WE'RE PUBLISHED!



Durable Concrete—Guide  
Reported by ACI Committee 201

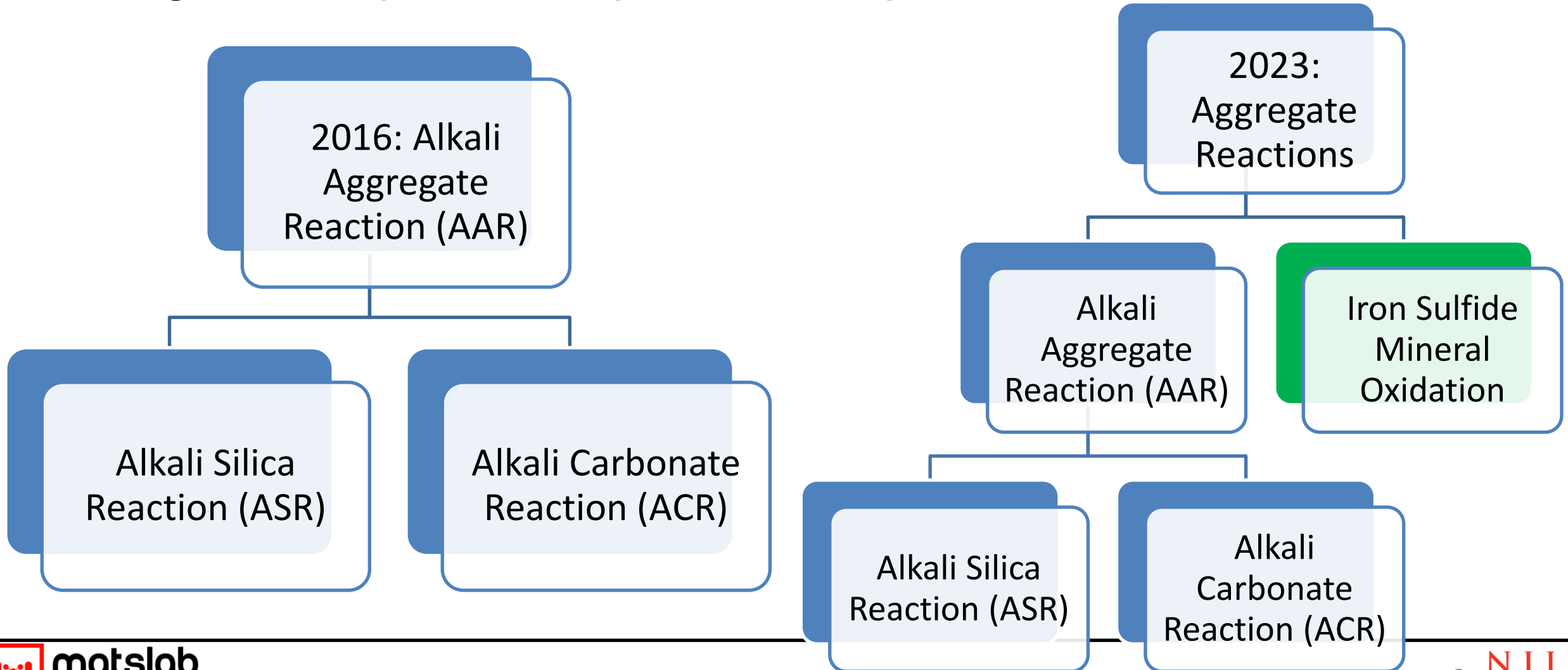
ACI PRC-201.2-23



- New Durable Concrete – Guide
  - April Snyder, Thanos Drimalas, Leandro Sanchez, Anol Mukhopadhyay, 201H
  
- Revision of the 2016 document
  
- Revisions to
  - Chapter 5 – Aggregate Reactions
  - Chapter 6 – Sulfate Attack
  - Chapter 8 – Physical Salt Attack
  - Chapter 10 - Abrasion

# CHAPTER 5 – AGGREGATE REACTIONS

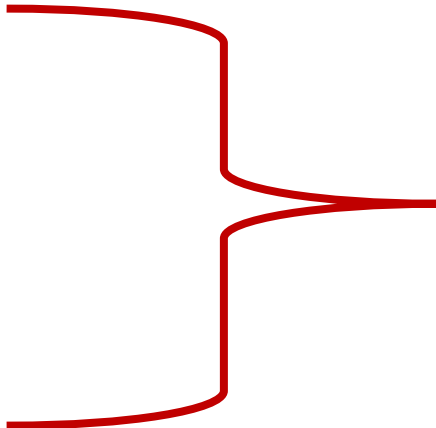
- Significant update to expand the scope of the chapter



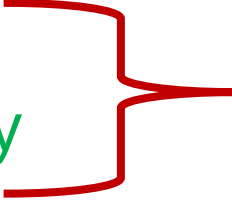
# UPDATES TO ALKALI AGGREGATE REACTIONS – 5.1

- 5.1.1 – Types of Reactions
- 5.1.2 – ACR Background
- 5.1.3 – ASR Background
- 5.1.4 – Mechanisms of Gel Expansion
- 5.1.5 – Evaluating Aggregates for Potential Alkali-Aggregate Reactivity
- 5.1.6 – Preventive Measures
- 5.1.7 – Tests for Evaluating Preventive Measures
- 5.1.8 – Protocols for Minimizing Risk of ASR

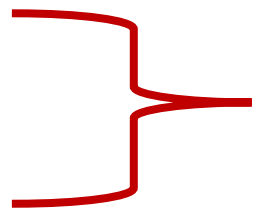
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- Minor changes
  - Add information on new understanding - minimal
  - Current references

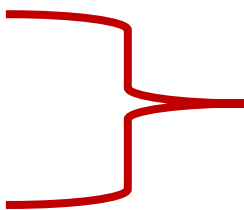
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- Focus on established and standardized test methods
    - ASTM, AASHTO, CSA, RILEM
  - Additional information on role of field exposure site
    - References for guidance on establishing new sites

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- 
- Updated to match recent updates in ASTM C1778 protocols – Current best practices



# TALKS TODAY FOR FURTHER INFORMATION ON AAR

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- Understanding of ASR Mechanisms
- ASR Test Methods
- Prevention of ASR
- ASR Case Studies

# UNDERSTANDING OF ASR MECHANISMS

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- A New Approach to Preventing Alkali-Silica Reaction in Concrete: Alkali Sensitivity Evaluation
  - Jason Ideker – Oregon State University
  - 10:10 AM
  
- Using a Combined CT Scan/Scanning Electron Microscope Protocol to Appraise and Better Understand Alkali-Silica Reaction Induced Expansion and Deterioration in Concrete
  - Leandro Sanchez – University of Ottawa
  - 11:00 AM

# ASR TEST METHODS

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- Innovative Performance-Based Approach Using Emerging Test Methods for Evaluating the Effectiveness of Conventional Alternative SCMs to Mitigate ASR
  - Anol Mukhopadyay – Texas A&M
  - 11:30 AM
- Assessment of Aggregate Reactivity Using and Ultra-Rapid Autoclave Test Method
  - Stephanie Wood – Army Corps of Engineers – ERDC
  - 12:00 PM
- AASHTO T380 (MCPT) Based Approach Towards Evaluating ASR Potential of Job Concrete Mixtures
  - Prasada Rangaraju – Clemson University
  - 12:30 PM

# PREVENTION OF ASR

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- Alkali Threshold – A Powerful ASR Risk Management Tool
  - Terence Arnold – FHWA
  - 9:45 AM
- A New Approach to Preventing Alkali-Silica Reaction in Concrete: Alkali Sensitivity Evaluation
  - Jason Ideker – Oregon State University
  - 10:10 AM
- Improving the Guidance to ASTM C 1778 for Mitigating Alkali-Silica Reaction
  - Thanos Drimalas – UT Austin
  - 8:55 AM

# ASR CASE STUDY

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- Pennsylvania's Experiences and Challenges Implementing Comprehensive ASR Specifications 2015-2024
  - Jim Casilio – Pennsylvania Aggregates and Concrete Association
  - 8:30 AM

# NEW SECTION ON IRON SULFIDE MINERALIZATION 5.2

- 5.2.1 – Introduction
- 5.2.2 – Occurrence and Mineral Identification
- 5.2.3 – Oxidation Reaction Mechanism and Potentially Deleterious Reactions in Concrete
- 5.2.4 – Factors Affecting Potential Deleterious Oxidation Reaction of Pyrrhotite in Concrete
- 5.2.5 – Standardization and Test Methods for Potentially Deleterious Iron Sulfide Mineral Oxidation in Concrete Aggregate

# TALKS TODAY FOR FURTHER INFORMATION ON IRON SULFIDE MINERALIZATION

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- Iron Sulfide Oxidation Mechanisms
- Iron Sulfide Oxidation Test Methods
- Case Studies in Iron Sulfide Oxidation

# IRON SULFIDE MINERALIZATION MECHANISMS

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- Kinetics of Iron Sulfide Oxidation in Simulated
  - Zhanzao Li – Pennsylvania State university
  - 1:30 PM



# IRON SULFIDE OXIDATION TEST METHODS

- Development, Calibration and Application of a Test Method to Determine the Content of Sulfates and Sulfides in Concrete Foundation
  - Leana Santos– University of Connecticut
  - 2:20 PM
- Pyrrhotite Oxidation – Insights into Laboratory Testing of Concrete Expansion and Deterioration and the Acceleration of Reaction Rates
  - Meshach Ojo – University of Connecticut
  - 2:45 PM
- Direct Pyrrhotite Testing and Map Cracking Risk Assessment using Magnetic Susceptibility Loss and Total Sulfur Method
  - Jonathan Gourley – Trinity College
  - 3:10 PM

# CASE STUDY IN IRON SULFIDE OXIDATION

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- Environmental Conditions in Concrete Housing Foundation Walls Incorporating Reactive Sulfide-Bearing Aggregates: Results from On-Site Monitoring Over a Year Period
  - Castillo Araiza Rodolfo – Laval University
  - 1:55 PM



**THANK YOU!**

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**matslab**

materials and structures  
laboratory at NJIT