

### **Session 3 Unanswered Questions:**

Q: I am interested in finding out the chemical reaction that the specimen (ASR affected) had undergone. Which test method can give that type of information?

Q: Did Solid state NMR will be helpful in getting those information?

A: The reaction was discussed briefly in the workshop but more information is given in the "AAR Facts Book". Solid-state NMR has provided useful information on the changes in the nature of the silica as a result of exposure to alkali-hydroxide solution. Reference should be made to publications on this subject.

Q: Is there a size pessimum effect for ASR and ACR?

Q: a flower-like photomicrograph appears to be calcium hydroxide instead of ASR gel?

Q: Did you ever come across very old structures, say ~100 yrs, that were likely affected by ASR, but little ASR gel was observed, due to possible reaction between ASR gel and CH or high Ca CSH?

Q: I mean a back-scattered electron image at a corner.

A: There is a pessimum effect for some alkali-silica reactive aggregates but the authors are not aware of any such effect being reported for ACR. Second Q is not a question and we are unsure what photomicrograph is being shown. ASR reaction products have been detected in ~ 70-year-old structures where some, but NOT all, of the gel has been "converted" to a product that is similar in composition to C-S-H.

Q: As you show the ASR gel filling the air entrainment voids, does this then eliminate the benefit of A/E in the concrete.

Q: As a follow up, if the concrete is designed with expanded shale, clay or slate LW aggregates, will the voids in these aggregates provide a space for the ASR gel to go, thereby "protecting" the A/E voids.

A: Generally the extent of air-void filling by alkali-silica gel would not be expected to significantly compromise the freeze-thaw resistance of the concrete. However, the microcracking that occurs can lead to a reduction in resistance as it can lead to a very significant increase in the amount of freezable water in the concrete. It is possible that the porosity provided by LWA could accommodate some of the gel thereby reducing the amount of expansion and/or the amount of gel that enters the air voids. This should be the subject of future investigations.

Q: Do you see more serious deterioration from coarse aggregate or fine aggregate ASR?

A: The simple answer is that it depends on the aggregate! However, in most cases one might expect an increase in the rate of reaction with fine aggregate (compared to coarse aggregate of the same mineralogy) but perhaps not much difference in the ultimate (final) expansion.

Q: On slide 34 the Gel is present in the Paste and voids but not within the aggregate. How would you explain this?

A: The gel that forms in the aggregate is usually very soft and fluid, and may easily be lost during specimen preparation. As the gel migrates into the paste (and voids with the paste) it picks up calcium and becomes more viscous and rigid thereby resisting removal during preparation.

Q: What is your experience using methyl methacrylate as a sealant and mitigation measure?

A: No direct experience but it is expected that methyl methacrylate would not allow the concrete to “breathe” (i.e. it would prevent the escape of water vapor) and, as such, may not be effective in reducing the internal RH. However, it is recommended that appropriate testing be performed.

Q: Please clarify if there will always be reactive products at the cracks. This is important if I am to have a clear dichotomy between ASR and structurally induced cracks that would also go through aggregates

A: No, there will NOT always be reaction products in the vicinity of the cracks.