



## James ASR Detect\*

**Simple colored dye field test to detect Alkali Silica reaction (ASR)**

### **Features and Benefits**

- Test can be carried out completely on site.
- Minimal operator training and no special equipment required.
- Utilizes only two environmentally safe dyes.
- Identifies ASR in concrete and differentiates ASR from other causes of degradation.
- Results obtained in less than five minutes are easy to interpret.
- Economic, fast and easy to use.

*\* US Patent No. 5,739,035 and other patents pending.  
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## Method

**S**imply apply each of the two reagents to the broken surface of a concrete core drilled in a suspect structure and rinse off the excess. On ASR contaminated concrete, the resultant stains reveal the presence of ASR.

The stain's distribution shows the extent of ASR in the concrete, and their proximity to different components of the aggregate gives clues to the source of trouble. The two gels that are identified—one staining yellow, the other pink—indicate the stage of ASR's progression. Yellow signals that degradation has begun. Pink warns that degradation is advancing.

Typically, ASR occurs in cracks and these cracks often cut through the aggregate and usually do not follow the aggregate-paste boundaries. ASR tends to fill air voids.

## Advantages

**I**n contrast to the two established methods of ASR detection—petrographic analysis and uranyl acetate analysis, ASR Detect has numerous benefits.

Because the reagent stains are clearly visible even before the treated sample dries, a complete diagnosis is possible in less than 5 minutes. ASR Detect systems are relatively inexpensive. Petrographic analysis requires shipment to a laboratory, adding time and raising the costs to hundreds of dollars per sample, also the uranyl acetate reagent is almost prohibitively expensive. ASR Detect is simple enough to use in the field. Its reagent stains are visible to the naked eye and are distinctive enough to be recognized and interpreted by anyone with minimal training. Petrographic analysis requires specially trained technicians working in a well equipped laboratory. Therefore, the use of ASR Detect can considerably reduce the cost of diagnosis by reducing drastically the need for petrographic analysis.

The ASR Detect reagents present minimal danger to either human health or the environment. Uranyl acetate is radioactive and contains a heavy metal and therefore, has the potential to cause health and disposal problems.

ASR Detect provides information not only about the presence but also the severity of ASR. Its affordability allows an engineer to analyze enough samples to obtain an accurate diagnostic picture of an entire structure. The high cost of a petrographic analysis permits only a limited number of samples to be examined.

## Applications

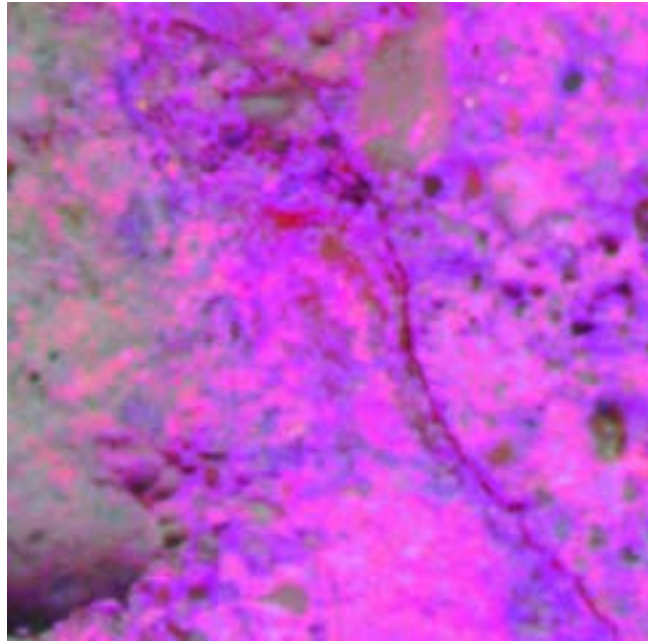
**A**SR Detect is both a practical and a scientific tool. Its principal application is analyzing existing concrete structures. By identifying ASR deterioration in its earliest stages, ASR Detect facilitates the problem being identified when remediation techniques can be applied; for example, treating the concrete with a lithium-bearing solution to inhibit further deterioration. Where deterioration is advanced, ASR Detect provides a clear picture of the extent and depth of the damage.

As a scientific tool, ASR Detect can be applied to improving the understanding of where, how and why ASR occurs. That understanding is basic to developing ASR preventatives that allow high-alkali cements or poor-quality aggregates to be used in concrete mixes without risking the development of ASR.

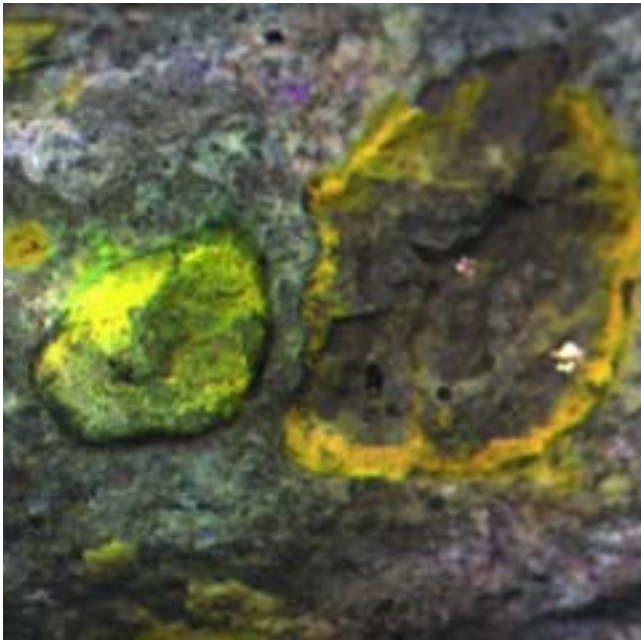
**Untreated concrete.**



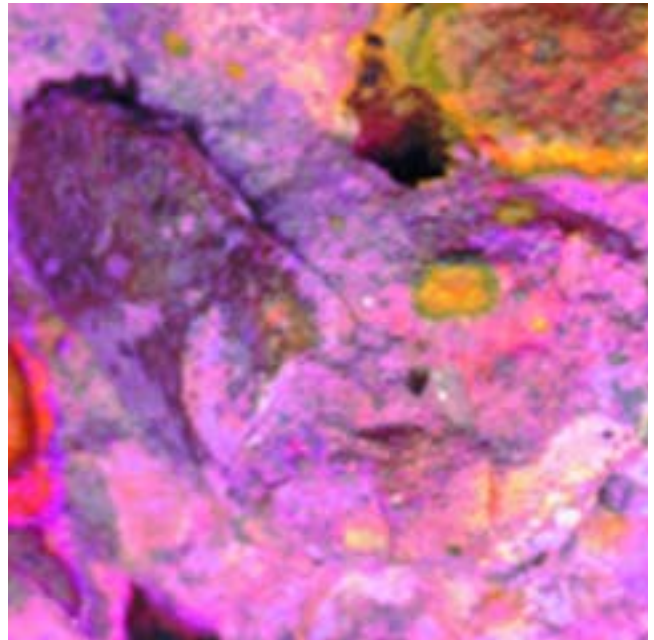
**Concrete tested with pink gel only showing advanced ASR degradation.**



**Concrete tested with yellow gel only showing beginning stages of ASR degradation.**



**Concrete tested with pink and yellow gels showing both beginning and advanced stages of ASR.**





**Concrete Core Showing Advanced ASR**

## **Technical**

One of the primary causes of premature concrete deterioration is alkali-silica reaction (ASR). ASR causes concrete to deteriorate when sodium and/or potassium from the cement attacks silica rich components in the aggregate, producing gels that expand and eventually crack the structure.

There are four main causes of concrete degradation

- **Alkali-Silica Reaction (ASR)**
- **Freeze thaw cycles**
- **Corrosion of reinforcement bars**
- **Sulphate attack**

To evaluate degrading concrete and prescribe treatment, the correct diagnosis of the cause is essential.

ASR Detect was developed by Los Alamos National Laboratory as part of its ongoing effort to characterize concrete degradation mechanisms and to improve concrete durability.

ASR Detect exploits the cation-exchange and compositional properties of ASR gels to pinpoint ASR degradation in a chemically specific way. Most gels contain cations (positively charged atoms or molecules) that readily exchange with other cations in solution. ASR Detect's two reagents react with cations found in the two gels associated with ASR. The first reagent exchanges sodium with the potassium found in some ASR gels and then reacts to form a bright yellow precipitate. The second reagent reacts with calcium-rich ASR gel to form a bright pink stain. In concrete containing ASR, the result is a brightly colored surface showing the presence of the targeted gels; concrete with no ASR is unaffected.

## **Sales Numbers & Specifications**

### **TEST KIT - ASR 3000**

- One 60 ML Bottle of yellow reagent
- One 60 ML Bottle of pink reagent
- One 250 ML Bottle of distilled water
- Two dispensing pipettes
- One pair of protective gloves
- One pair of protective goggles
- One apron
- Carrying case

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