

# Carbonate Staining with Alizarin Red

## Carbonate Staining With Alizarin Red S

Procedure summarized for IODP shipboard thin section laboratory. Original published technique **Dickson, J.A.D. 1965. A Modified Staining Technique for Carbonates in Thin Section. Nature, 205, page587**

### Background:

Different carbonate minerals are not easily distinguished in thin section. Staining thin sections, or the billets, makes differentiation possible as the stain fixes to certain carbonates and not others. The staining can be done on half of a thin section or billet so that the other half remains unaltered. The stain is only superficial and is thus considered "non-destructive" from a curation point of view but it is important to label any billets that have been treated so future users are aware. Solutions can be made ahead of time and used more than once. Store them in a dark cool place but staining solutions are best to use within 3-4 days maximum as the colors will start to degrade.

### Materials:

- Foil weighing dishes
- 0.5L Hydrochloric acid, 1.5% (chem lab) HCl
- Alizarin Red S (thin section staining drawer) A.R.S.
- Potassium ferricyanide (thin section staining drawer) P.F.
- DI water, or nanopure, either is acceptable and the nanopure has the nice hand held dispenser for rinsing between stages
- 100ml plastic Nalgene bottles (3)
- 50ml plastic nalgene bottle

### Procedure:

If staining on a billet you must flatten and polish the billet to 600 grit and have it ready to be put on a slide. You cannot polish or flatten the billet after it has been stained. If staining on an already made thin section, no special prep is necessary except making sure there is no slide oil or cover slip.

Making solutions:

To make 500ml (0.5L) of 1.5% HCl you must dilute the stock solution of 37% (at time of writing, always check the concentration of stock solution first). Measure 20ml of HCl, pour into a 500ml flask and fill the rest up with DI water. You will now have enough 1.5% HCl to use for Stage I, make the other solutions, and have extra left over. You can save the leftovers and use it to make more staining solutions later in the expedition. All solutions are very weak acids and can be flushed down the chem lab sinks with lots of water.

A.R.S. solution:

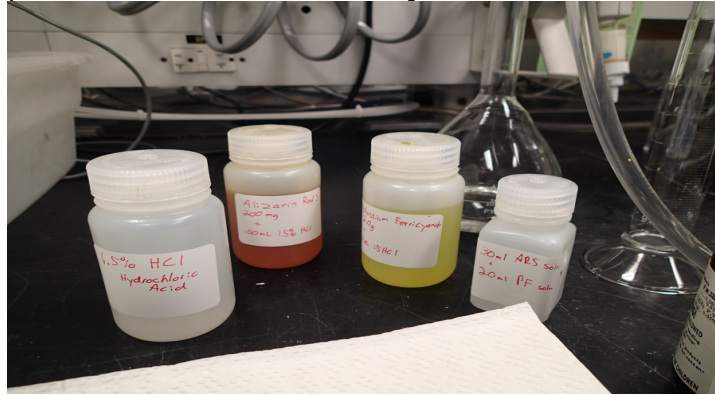
Use the Cahn balance in the chemistry lab to measure 0.2g (200mg) of A.R.S. and put it into a 100ml Nalgene. With a graduated cylinder measure and add 100ml of the 1.5% HCl that you mixed in the first step. Screw the cap on tightly and invert a few times to stir and make sure all the granules dissolve.

P.F. solution:

Use the Mettler Toledo balance in the chemistry lab to measure 2.0g of P.F. and put it into a 100ml Nalgene. With a graduated cylinder measure and add 100ml of the 1.5% HCl that you mixed in the first step. Screw the cap on tightly and invert a few times to stir and make sure all the granules dissolve.

Combining A.R.S. and P.F. Solutions:

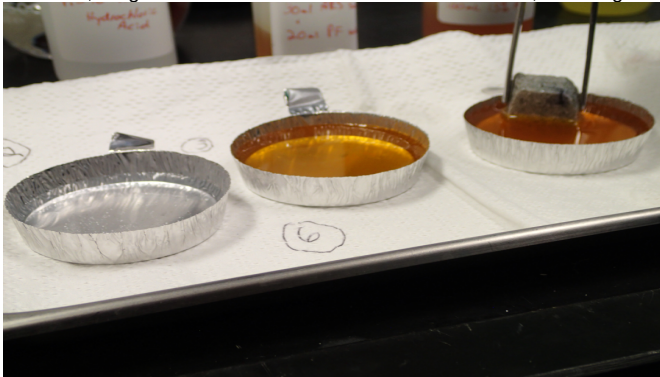
The two solutions you just made now need to be mixed in ratio A.R.S. : P.F. = 3:2. The easiest way to accomplish this is to mix 30ml of the A.R.S. solution with 20ml of the P.F. solution. Use a graduated cylinder and add these amounts to a 50ml Nalgene.



You now have four Nalgene bottles of solutions.

Staining:

Use 3 foil weighing pans and pour enough of the solutions so that you will cover half of the thin section slide or billet when dipped in. Stage 1 is just the 1.5% HCl, Stage 2 is the combined A.R.S. and P.F. solution, and Stage 3 is the A.R.S. solution.



Stage 1: 1.5% HCl: Using large tweezers, dip the entire face/side of the billet or slide that is to be stained. For the other stages it is important to only dip half way but for this stage, since it doesn't stain, it can be done on the entire surface. Hold in the HCl for 10-15 seconds and then rinse with DI or nanopure water. I found it best to place a large beaker under the handheld nanopure dispenser and rinse the slide or billet off in the water stream, and not dunk it into the beaker.

Stage 2: Combined A.R.S. and P.F.: Dip half of the slide or billet in this mixed solution for 30-45 seconds and rinse with DI or nanopure as before.

Stage 3: A.R.S. : Dip the same half of the slide in the A.R.S. solution for 10-15 seconds and rinse with DI or nanopure as before.

The billet or slide can now be set out to dry on paper towels or in a slide box, but be careful not to touch the stained surface to anything or the stain can rub off. Billets can be set back on the hot plate to dry out completely to prepare for applying epoxy and a slide. Epoxy application is the same as our normal procedure. Slides are ready to be viewed once dry.