

Manual for pH Dye Preparation Version 1.0:

Preparation of indicator dye, *m*-cresol purple, for use in the spectrophotometric determination of the pH of sea water

This SOP was adapted from Dickson et al (2007, SOP 6b) for use with the GOA-ON in a Box equipment ([list is available here on GOA-ON website](#)). More information about GOA-ON in a Box efforts and related SOPs referenced below are available on the GOA-ON website under [Resources](#).

“GOA-ON in a Box” is the name used to describe equipment being provided through an international scientific capacity building effort being conducted to support the Global Ocean Acidification Observing Network.

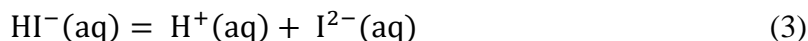
1. Overview

This procedure describes a method for the preparation of a solution of the indicator dye, *m*-cresol purple, used for the spectrophotometric determination of the pH of sea water. This SOP should be used in conjunction with the [Manual for pH Determination](#) Version 1.0, which includes a PDF and an accompanying spreadsheet.

A 2 mmol L⁻¹ solution of *m*-cresol purple dye is adjusted to be in the range 7.9 ± 0.1 pH units, which is chosen to be similar to the sample pH, is required. The dye solution is made in a sodium chloride matrix so that the ionic strength is similar that of seawater.

2. Principle

The pH of seawater can be determined by adding an indicator dye to a sample of sea water. For the sulfonephthalein indicators such as *m*-cresol purple, the reaction of interest at seawater pH is the second dissociation



where I represents the indicator dye, which is present at a low level when measuring a sea water sample. The total hydrogen ion concentration of the sample can then be determined:

$$\text{pH} = \text{pK}(\text{HI}^{-}) + \log_{10} \frac{[\text{I}^{2-}]}{[\text{HI}^{-}]} \quad (4)$$

The principle of this approach uses the fact that the different forms of the indicator have substantially different absorption spectra. Thus, the information contained in the composite spectrum can be used to estimate $[\text{I}^{2-}]/[\text{HI}^{-}]$.

4. Recipe for preparation of m-cresol purple

2 mmol L⁻¹ solution of m-cresol purple in a sodium chloride solution

4.1 Reagents

m-Cresol Purple sodium salt (C₂₁H₁₇NaO₅S; MW=404.41 g mol⁻¹)

NaCl salt

De-ionised or distilled water

0.1 mol L⁻¹ HCl solution

0.1 mol L⁻¹ NaOH solution

4.2 Apparatus

Balance (readable to 3 decimal places)

pH electrode and meter

2 Spatulas

2 Weighing vessels

250 mL volumetric flask with stopper

Funnel to fit volumetric flask

Pasteur pipettes

4.3 Procedure

- 1 Weigh out 0.202 g of m-cresol purple sodium salt
- 2 Weigh out 10.2 g of NaCl salt
- 3 Put the funnel into the 250 mL volumetric flask and add about 100 mL of deionized water
- 4 Rinse the m-cresol purple sodium salt into the volumetric flask with deionized water
- 5 Rinse the NaCl into the volumetric flask with deionized water
- 6 Remove the funnel, carefully fill the flask to the fill line with deionized water to make 250 mL of dye solution
- 7 Transfer to a screw cap glass bottle and seal.
- 8 Measure the pH of the dye with an electrode. Adjust until the pH is between 7.8 and 8.0
 - If the pH of the dye solution is less than 7.8, add 0.1 mol L⁻¹ NaOH solution dropwise until the pH increases to 7.9±0.1

- If the pH of the dye solution is greater than 8.0, add 0.1 mol L⁻¹ HCl solution dropwise until the pH increases to 7.9±0.1
- 9 Test the pH before each use, and adjust to 7.9 ± 0.1 pH units if necessary. This dye solution should last for several months.

5. Reference

Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.) 2007. Guide to best practices for ocean CO₂ measurements. PICES Special Publication 3, 191 pp.

available from:

<http://www.ioccp.org/index.php/documents/standards-and-methods/2-uncategorised/263-guide-to-best-practices-for-ocean-co2-measurements>