# BROMINE METHOD 1

**Using DPD**

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## INTRODUCTION

The following procedures allow for the determination of Active Bromine residual and the distinguishing between Free Bromine, Combined Bromine and other residuals.

## PRINCIPLE OF THE METHOD

Both Free and Combined Bromine react with diethyl-*p*-phenylenediamine (DPD) to give a red colour. If nitrite is added before the DPD, the Free Bromine is inhibited thus allowing determination of the Combined Bromine. Addition of iodide then facilitates estimation of other residuals.

## REAGENTS REQUIRED

1. **Lovibond DPD No.1 Tablets (Comparator)**
2. **Lovibond DPD No.3 Tablets (Comparator)**
3. **Lovibond DPD Nitrite Tablets**
4. **Lovibond Glycine Tablets (for separating Chlorine and Bromine)**

## THE STANDARD LOVIBOND COMPARATOR DISCS 3/53A, 3/53B and 3/53C

Disc 3/53A covers the range 0.2 to 2.0mg./l. Bromine in steps of 0.2mg./l. (omitting 1.8).

Disc 3/53B covers the range 1.0 to 10mg./l. Bromine in steps of 1.0mg./l. (omitting 9.0).

Disc 3/53C covers the range 0.5 to 6.0 mg./l. with steps of 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0 and 6.0 mg./l.

All discs are used with 13.5mm./10ml. moulded cells.

## METHOD

### A) "Active Bromine"

1. Fill a 13.5mm./10ml. moulded cell to the 10ml. mark with the sample to be tested and place it in the left-hand compartment of the Comparator.
2. Rinse another 10ml. cell with sample, leaving only a few drops of sample in the cell, and add one DPD No.1 tablet. Crush using the flat end of a clean stirring rod.
3. Fill to the 10ml. mark with sample and mix well dissolve the tablet.
4. Place the cell in the right-hand side of the Comparator and match against the disc by holding the Comparator facing a standard source of white light, such as the Lovibond Daylight 2000 Unit or North daylight (not fluorescent lighting) and rotate the disc until the nearest colour match is obtained.
5. The figure displayed in the bottom right-hand corner of the comparator is the concentration, in mg./l, of Bromine (Reading **A**.)

**B) Combined Bromine**

1. Prepare a cell with tablet as in A 2. above.
2. Take a second cell, filled to the 10ml. mark with sample, and add one DPD Nitrite tablet. Crush and mix to dissolve.
3. Add the contents of this cell to the one containing the crushed DPD No.1 tablet. Mix to dissolve.
4. Rinse out the empty cell with sample, fill to the 10ml. mark and place it in the left-hand side of the Comparator.
5. Match the colour and note the reading, in mg./l. Bromine (Reading **B.)**.

**C) Other Residuals**

1. Immediately after taking the reading B above, add one DPD No.3 tablet to the cell containing the treated sample. Crush and mix to dissolve.
2. Stand for 2 minutes.
3. Match the colour and note the reading, in mg./l. Bromine (Reading **C**.).

**CALCULATION**

1. **Reading A** gives Active Bromine
2. **Reading (A-B)** gives Free Bromine
3. **Reading B** gives Combined Bromine (Note 2)
4. **Reading (C-B)** gives Other Residuals (Note 3)

For routine control purposes the determination of the Active Bromine concentration (**Reading A)** is sufficient.

**NOTES**

1. If a Bromine disc is not available, Lovibond Chlorine discs may be used. The Comparator reading, as chlorine, should be multiplied by 2.25 to convert to mg./l. Bromine.
2. Combined Bromine consists of simple Bromine derivatives e.g. mono-bromamine.
3. Other Residuals, when present, consist of more complex organobromo derivatives of varying stability.
4. If Chlorine is added independently e.g. as Sodium or Calcium Hypochlorite the following procedure is followed for its separation and determination.

**ACTIVE BROMINE AND FREE AND COMBINED CHLORINE**

1. **Reading A** above now corresponds to Active Bromine plus Free Chlorine. After taking the reading add a DPD No.3 tablet to the right-hand cell, mix to dissolve and allow to stand for 2 minutes.
2. Match the colour against the disc - **Reading D**. The difference between this and **Reading A** is the concentration of Combined Chlorine.

3. Rinse out the cell thoroughly and then fill to the 10ml. mark with fresh sample, add a Glycine tablet, and mix to dissolve.

4. Take another cell, rinse thoroughly and leave empty. Add a DPD No.1 tablet and crush.

5. Pour in the solution containing the Glycine tablet and mix to dissolve the DPD No.1 tablet completely.

6. Match immediately against the disc - **Reading E**. This is the concentration of Active Bromine. To obtain the concentration of Free Chlorine subtract **Reading E** from **Reading A.**

7. The readings for Chlorine are in terms of Bromine using these discs. To obtain the concentration of Free and Combined Chlorine the differences obtained should be multiplied by 0.44.

   Thus:
   Free Chlorine = 0.44 x (**Reading A** - **Reading E**)
   Combined Chlorine = 0.44 x (**Reading D** - **Reading A**)

**REVISION HISTORY**

| Date | Change Note | Issue |
|---|---|---|
| 05/03/02 | 36/460 | 2 |
| 14/04/05 | CA243 | 3 |
| 12/01/06 | JC09 | 4 |
| 08/01/08 | JC134 | 5 |