



## *NaOH in Electroless Copper Bath*

### **Introduction**

Chemical copper baths, used in particular in the manufacture of printed circuits, contain copper salts, sodium hydroxide stabilising agents and formol. The sodium hydroxide concentration of the bath is generally between 8 and 12 g/l. Formol concentration is between 3 and 8 g/l. The NaOH determination uses an acid/base titration.

### **Principle**

The OH<sup>-</sup> content is simply determined by an acid/base titration using a 0.1 eq/l strong acid as titrant.

### **Electrode and reagents**

pHC2011-8 Combined pH Electrode (part no. E16M317)

Hydrochloric acid 0.1 eq/l

Slowly add 8.3 ml of concentrated hydrochloric acid to 500 ml of distilled water and dilute to exactly 1000 ml. Calibrate the titrant versus Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>·10 H<sub>2</sub>O (sodium borate) as standard (see separate note)

Distilled water

IUPAC Series pH standards pH 4.005 (part no. S11M002) and pH 10.012 (part no. S11M007)

### **End Point titration settings**

Burette volume:	25 ml
Stirring speed:	400 rpm
Working mode:	pH
Number of end points:	1
End point:	10.00 pH
Stirring delay:	30 seconds
Minimum speed:	0.2 ml/min
Maximum speed:	10 ml/min
Proportional band:	3.00 pH
End point delay:	10 seconds
Sample unit:	ml
Sample amount:	5
Titration:	Decreasing pH
Result:	g/l

### **Procedure**

Calibrate the combined pH electrode using the 2 IUPAC standards above.

Pipette 5 ml of sample.

Dilute the sample with the same volume of distilled water each time (no more than 50 ml maximum).

Dip electrode and delivery tip in the solution.

Start method by pressing the RUN key.

### **Results**

**Expressed as NaOH content (MW = 40 g/mol) in g/l**

As in this case 1 molecule of titrant reacts with 1 molecule of NaOH:

$$R(\text{NaOH}) = V(\text{titr}) * C(\text{titr}) * 40 / V(\text{smp})$$

-V(titr) = total volume of titrant to reach the end point in ml

-V(smp) = current sample amount

-C(titr) = exact concentration of the titrant in eq/l

### **For a result in g/l**

Enter

The sample amount in the SAMPLE screen

The titrant concentration in the TITRANT screen

1 Titrant and 1 Sample in the COEFFICIENTS display

40 for NaOH molecular weight in the first method

The Titration Manager gives a result according to the above formula.

10 determinations on the same bath

Mean (as NaOH): 8.8 g/l

Standard deviation: 0.04 g/l

Rel. standard deviation: 0.5%

### **Working range**

Results are expressed in g/l of NaOH (MW = 40 g/mol)

1 ml of HCl 0.1 eq/l represents 4 mg of NaOH or, with a 5 ml sample volume, a NaOH content corresponding to 0.8 g/l

The working range can be calculated according to the following formula

$$\text{Result (in g/l)} = V(\text{titr in ml}) * 0.8 * 1000 / V(\text{smp})$$

Using application note conditions (5 ml volume sample and 25 ml titrant burette), it is possible to obtain results between 7 g/l (for 35% capacity of the burette) and 20 g/l (for burette capacity) with the best possible accuracy and reproducibility.

For other NaOH contents, change the burette cylinder capacity and/ or sample volume.

## **Notes**

---

- 1) Ensure you use a high alkalinity electrode such as the pHC2011-8.
- 2) Before starting a determination cycle, always calibrate the combined pH electrode using pH 10.012 standard (part no. S11M007).
- 3) According to certain bath manufacturer's protocols, the pH value for the end point titration can change and be between 9.5 and 10.50.