

ALKALI CONTENT OF THE FREE AND USED SOLUTION

1. Short description of the method

The liquor can be titrated with a standardised or non-standardised acid, first to the end point of phenolphthaleine and then further to the end point of methyl orange.

2. Remarks

For the determination of hydroxide in the presence of carbonate or bicarbonate, use is made of the different sensivity of phenolphthaleine and methyl orange to carbonic acid. The total content of the hydroxide ($\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$) and half the content of carbonate ($\text{Na}_2\text{CO}_3 + \text{HCl} \rightarrow \text{NaHCO}_3 + \text{NaCl}$) and the sulphide is detected by the first titration with phenolphthaleine, the second half of the carbonate or sulphide is determined by the second titration with methyl orange ($\text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{CO}_2 + \text{H}_2\text{O}$)¹.

The strength of the acid used and the amount of liquor sample used in the determination is immaterial, since it is only the ratio of the two values which is needed, i.e. a measured quantity of liquor or a standardised acid need not be used.

3. Solutions

a) Phenolphthaleine solution: 0,1 g phenolphthaleine is dissolved in 100 ml 96 % ethanol.

b) Methyl orange solution: 0,1 g methyl orange is dissolved in 100 ml water.

¹⁾ As well as the hydrogen carbonate in theory. However, hydrogen carbonate is not present, since in alkalis carbonic acid can only exist as carbonate and not as hydrogen carbonate.

GET pH 2-11
 electr. input 1
 titr. rate 1.00 ml/min
 anticis. 5
 stop V 8.00 ml
 temp. 21.0 °C
 EP crit. 4
 =====

date 85-01-03 time 16:23

GET pH 2-11 # 16
 C00= 2 ml
 pH(init) 13.31

	V/ml	pH
EP1	5.225	11.17
EP2	6.010	8.43
EP3	7.176	4.06

RS1	143.52	g/l
RS2	112.11	g/l
RS3	104.49	g/l
RS4	96.88	g/l
RS5	14.85	g/l
RS6	41.62	g/l

stop V reached

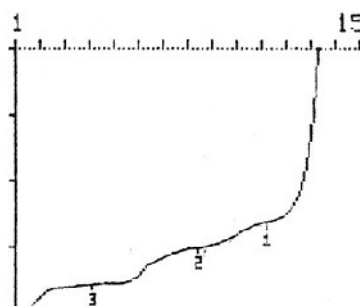
=====

GET pH 2-11
 F1=EP3*C01*C02/C00;2;g/l ✓
 F2=(EP3-C03*EP2+C03*EP1)
 *C01*C02/C00;2;g/l ✓
 F3=EP1*C01*C02/C00;2;g/l ✓
 F4=(C03*EP2-EP3)*C01*C02
 /C00;2;g/l ✓
 F5=(EP3+EP1-C03*EP2)*C03
 *C02*C04/C00;2;g/l ✓
 F6=(EP2-EP1)*C03*C02*C05
 /C00;2;g/l ✓

C01 =	40
C02 =	1
C03 =	2
C04 =	39
C05 =	53

=====

date 85-01-03 time 16:25
 GET pH 2-11 # 16
 2.0ml/div ΔpH=1/div
 start V .000 ml



=====

date 85-01-03 time 16:25

GET pH 2-11 # 16
 C00= 2 ml

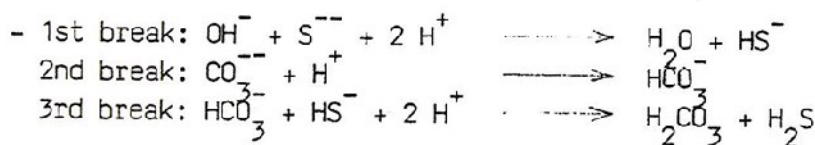
pH(init) 13.31

RS1	143.52	g/l
RS2	112.11	g/l
RS3	104.49	g/l
RS4	96.88	g/l
RS5	14.85	g/l
RS6	41.62	g/l

stop V reached

=====

----- ending titration.



- Calculations:

RS1 = total alcali ($\text{NaOH} + \text{Na}_2\text{S} + \text{Na}_2\text{CO}_3$) as g NaOH per liter
 RS2 = active alcali ($\text{NaOH} + \text{Na}_2\text{S}$) as g NaOH per liter
 RS3 = effective alcali ($\text{NaOH} + 1/2 \text{Na}_2\text{S}$) as g NaOH per liter
 RS4 = concentration of NaOH in g/l
 RS5 = concentration of Na_2S in g/l
 RS6 = concentration of Na_2CO_3 in g/l
 C01 = molecular mass of NaOH (40 g/mol)
 C02 = concentration of titrating agent (1 mol/l)
 C03 = factor (2)
 C04 = molecular mass of $1/2 \text{Na}_2\text{S}$ (39 g/mol)
 C05 = molecular mass of $1/2 \text{Na}_2\text{CO}_3$ (53 g/mol)