

**Total hardness in drinking
water**

Application

Use

This method is used for the quantitative determination of total hardness in drinking water.

The total hardness is the sum of calcium and magnesium hardness. It is possible to titrate the Ca- and Mg hardness with a Ca-ISE electrode as two equivalence points (EQs) in one titration. But it is recommended to use the more robust Cu-ISE for the determination of total hardness

Appliances

- Titrator: TL 6000/TL7000/TL7750
- Magnetic stirrer TM 235
- 20 mL exchange unit WA 20, incl. brown glass bottle for titrant
- GL 45 und S 40 bottle adapter
- Hoses and titration tip
- Drying tube

Electrodes

- Reference electrode: B 2920+
- Indicator electrode Cu 1100 A
- Kabel L 1 N

Application

Reagents

- Titrant: EDTA 0.1mol/l
- Ammonium chloride/ammonia buffer pH = 10
- Copper-di-ammonia Titriplex® solution
- Soda lime for CO₂ absorption on the reagent bottle

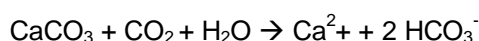
Description and Examples

The term “water hardness” is a system with several mutually coupled chemical equilibria. The water hardness is the one of the solubility equilibria between the different alkaline earth metal ions associated with the carbonate and sulphate precipitations (calcite, gypsum, e.g.) and the other from the solution and dissociation of carbon dioxide, carbon dioxide-carbonate system.



Pic. left: here, the hardness of the tap water has become visible. The lime has been set at the dripping faucet.

e.g.:



The total hardness is the sum of the concentrations of the cations of alkaline earth metals (magnesium and calcium ions) in water. Some additional ions such as iron are covered. Iron can interfere with the determination and is therefore masked with triethanolamine. These cations have a large, positive physiological significance, however, interfere with some uses of the water. Thus forming e.g. these cations introduced into the water insoluble calcium soaps, soap that have no more cleaning power.

Preparation of ammonium chloride/ammonia buffer solution pH= 10

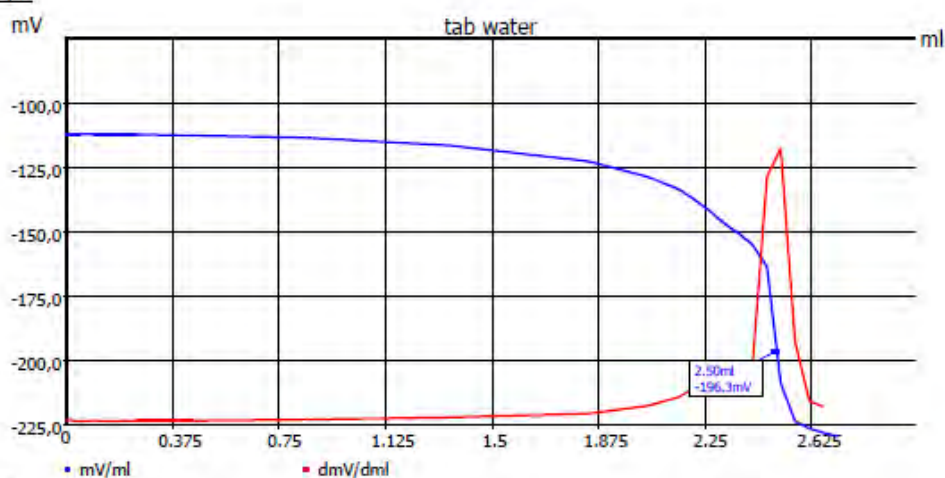
54 g Ammonium chloride for analysis are dissolved in 200 ml DI water. To this solution is added 350 ml of 25% Ammonia solution “Analytical grade”. Then it is filled up with DI water to 1 litre.

Procedure

In a 150 mL beaker, 100 mL of sample are measured accurately and mixed with 5 mL of ammonium chloride/ ammonia buffer pH= 10. After addition of 1 mL of copper-di-ammonium Titriplex® solution is titrated with 0.1 mol/l EDTA solution.

Application

Titration graph



Method data

Method name:	Hardness	Titration duration:	1 m 36 s
End date:	01.02.12	End time:	11:44:44

Titration data

Sample ID:	tab water	Pattern:	100.0000 ml
Start mV:	-112.0 mV	End mV:	-229.8 mV
EQ:	2.499 ml / -196.3 mV	Hardness:	2.499 mmol/l

Calculation formula

Hardness:	$(EQ1-B) \cdot T \cdot M \cdot F1 / (V \cdot F2)$
Mol (M):	1.00000

Blank value (B):	0.0000 ml	Titre (T):	auto
Factor 1 (F1):	1000.0000	Pattern (V):	Vol
Factor 2 (F2):	1.0000		

The titration parameters are described under "Method".

Calculation formula:

$$\text{total hardness [mmol/l]} = \frac{\text{Consumption[mL]} \cdot \text{Titre} \cdot 1000}{\text{Presentation Sample[ml]}}$$

Example:

$$\text{total hardness [mmol/l]} = \frac{2.613 \cdot 0.10025 \cdot 1000}{100}$$

Application

Method:

Method data overall view

Method name:	Hardness	Created at:	02/01/12 11:23:59
Method type:	Automatic titration	Last modification:	02/01/12 11:40:25
Measured value:	mV		
Titration mode:	Dynamic		

Dynamic: Flat

Measuring speed / drift:	:	minimum holding time:	03 s
		maximum holding time:	15 s
		measuring time:	02 s
		drift:	05 mV/min

Initial waiting time:	0 s
Titration direction:	Decrease
Pretitration:	Off
End value:	Off
EQ:	On
slope value:	Flat

Value: Flat 120

Dosing parameter

Dosing speed:	100 %	Filling speed:	30 s
Maximum dosing volume:	20.00 ml		

Unit values

Unit size:	20ml
Unit ID:	1296649042
Reagent:	Na EDTA 0.1 m
Batch ID:	no Charge
Concentration [mol/l]:	0.10000
Determined at:	02/01/12 19:41:43
Expire date:	--
Opened/compounded:	--
Test according ISO 8655:	--
Last modification:	02/01/12 11:41:46

Application



Hints

If you have any questions on the application, you can feel free to contact us.

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