KJ2050: Exercise No. 2

Determination of calcium and magnesium by complexonometric titration

DATA SHEET

Students: Eyvor, Marcus, Sverre, Alexander, Daniel

Collect your results in this sheet and remember to attach it to your report.

A. EDTA Solution: preparation and standardization

A.1. Preparation of 0.008 M EDTA (1.00 L)

Ethylenediaminetetraacetic acid disodium salt dehydrate (Na_2EDTA)-chemical formula:

$C_{10}H_{14}N_2Na_2O_8$

Na_2EDTA mole weight (g/mol, 4 decimals) (336,21) 336,2056 $n = \frac{c}{V}$

Calculated amount Na_2EDTA for 1000 ml of 0.008 M: 0,008 $n = \frac{m}{M_m}$

m_{EDTA} = 26,8968 g (4 decimals)

Amount of Na_2EDTA weighed out (m^{W}_{EDTA} ; it should be as close as possible to m_{EDTA}):

m^{W}_{EDTA} = 2,7127 g (4 decimals)

Calculated EDTA molar concentration:

C_{EDTA} = 0,00806857 mol/L

A.2. Standardization of the EDTA solution

A.2.1. Ca^{2+} standard solution (1.000 L)

Amount of $CaCO_3$ (weighing by difference): m_{CaCO_3} = 1.0057 g (4 decimals)

$CaCO_3$ mole weight: M_{CaCO_3} = 100.0869 g/mol (4 decimals)

Ca^{2+} concentration: (m_{CaCO_3} / M_{CaCO_3} /1L) c_{Ca} = 0.01005 mol/ L (4 decimals)

A.2.2. Titration of the Ca^{2+} solution against EDTA

Ca^{2+} solution aliquote volume: V_{Ca} = 0.025 L — −0,7

Titration data: Equivalence volume for three replicates (L)

1) 36.9 2) 36.5 3) 36.5

Average equivalence volume (V_e:) 36.6333 L

EDTA average concentration ($\overline{C}_{EDTA} = C_{Ca}V_{Ca} / V_e$) 0.00686 mol/L (4 decimals)

Deviation from the calculated value (%): $100\frac{\overline{C}_{EDTA} - C_{EDTA}}{C_{EDTA}}$ = 15 %

B. Determination of calcium and magnesium in presence of each other

Sample information

Sample No. ...16.....	Sample volume (V_S) 0,250 L
Sample analytes: Ca^{2+} and Mg^{2+}	Aliquot volume (V_A) 0,025 L

B.1. Determination of calcium concentration by titration in a strongly alkaline solution

Titration data:

Aliquote volume (V_A)...0,025 L

Outlier, gikk over eq. punktet

Equivalence volume for three replicates (~~L~~)

1) ...20,8 mL ..... 2) 20,2 lilla 20,25 mL mest blå 3) ..... 20,30 mL .....

Average equivalence volume (V_e:) ...20,225 ..... mL

Average calcium molar concentration: C_{Ca} ($=V_e\ C_{EDTA}/V_A$) ...~~0,0065436~~ 0,00556346 ..... mol/L

Results for calcium

M_{Ca} = ...40,0780 ..... g/mol

Amount of Ca^{2+} in the sample: ($m_{Ca} = C_{Ca}\ V_S\ M_{Ca}$) ...~~0,06556~~ 0,05574 ..... grams (4 decimals)

Expected amount of Ca, m_f (fasit) ..... grams

Deviation (avvik) $100\frac{m_{Ca} - m_f}{m_f}$ ..... %

B.2. Determination of the total concentration (C_t i.e. Ca^{2+} + Mg^{2+}) by titration in ammonia buffer at about 40° C

Titration data: Equivalence volume for three replicates (L)

1) ...37,4 mL ..... 2) ...37,2 mL ... 3) ...37,2 mL..

Average equivalence volume (V_e) ....37,267 ..... mL

Molar concentration of (Ca^{2+} + Mg^{2+}): C_t = 0,01023 .. mol/L (4 decimals)

$= V_e\ C_{EDTA} / V_A$

B.3. Calculation of magnesium content

Average magnesium concentration: $C_{Mg} = C_t - C_{Ca}$ ...0,00467.....mol/L (4 decimals)

Amount of Mg^{2+} in the sample: ($m_{Mg} = C_{Mg}\ V_S\ M_{Mg}$) ..0,02835.....grams (4 decimals)

Expected (fasit) m_f ..... grams

Deviation (avvik) $100\frac{m_{Mg} - m_f}{m_f}$ .....%

Summary of results (to be included in the report)

Sample No. .....16.....

	Found, g	**Expected, g**	**Deviation, %**
Calcium	0,0557		
Magnesium	0,0284		