Extraction and complexation of alkali and alkaline earth metal cations by lower-rim calix[4]arene diethylene glycol amide derivatives

ELECTRONIC SUPPLEMENTARY INFORMATION

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**Mass spectra** were obtained on Agilent 6420 Triple Quadrupole Mass Spectrometer. Solutions were introduced directly via Agilent 1200 HPLC system. For ionization enhancement formic acid \((w = 0.1 \%\), p.a. Kemika) was used. The ESI MS spectra were recorded in the range of \(m/z\) 100 to \(m/z\) 2000 in positive ion mode. The following parameters were used: capillary potential 4 kV, fragmentor voltage 135 V, gas flow rate 0.6 dm\(^{-3}\) min\(^{-1}\) and gas temperature 300 °C. Tandem mass spectrometry of protonated molecules was carried out using collision energies of 15–60 eV and nitrogen as a collision gas.

![Mass spectrum graph](image)

Figure S1. ESI mass spectrum of 1 in acetonitrile; \(c(1) = 2 \times 10^{-3}\) mol dm\(^{-3}\).
Figure S2. ESI mass spectrum of 2 in acetonitrile; $c(2) = 2 \times 10^{-3}$ mol dm$^{-3}$.

Figure S3. MS/MS spectrum of [1+H]$^+$. Collision energy = 45 eV.
Figure S4. MS/MS spectrum of [2+H]^+. Collision energy = 55 eV.
Scheme S1. The proposed fragmentation pathway of protonated molecular ion [1+H]^+.
Scheme S2. The proposed fragmentation pathway of protonated molecular ion [2+H]^+. 
Figure S5. (a) Spectrophotometric titration of 1 \( (c = 1.89 \times 10^{-4} \text{ mol dm}^{-3}) \) with LiClO\(_4\) \( (c = 2.30 \times 10^{-3} \text{ mol dm}^{-3}) \) in acetonitrile. \( l = 1 \text{ cm}; t = (25.0 \pm 0.1) \text{ ̊C}; n(\text{Li}^+)/n(1) = 0 \) (top curve) – 3.49 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 277 nm on \( n(\text{Li}^+)/n(1) \) ratio.

Figure S6. (a) Spectrophotometric titration of 2 \( (c = 3.24 \times 10^{-4} \text{ mol dm}^{-3}) \) with LiClO\(_4\) \( (c = 2.28 \times 10^{-3} \text{ mol dm}^{-3}) \) in acetonitrile. \( l = 1 \text{ cm}; t = (25.0 \pm 0.1) \text{ ̊C}; n(\text{Li}^+)/n(2) = 0 \) (top curve) – 1.90 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on \( n(\text{Li}^+)/n(2) \) ratio.
Figure S7. (a) Spectrophotometric titration of 1 \((c = 2.30 \times 10^{-4} \text{ mol dm}^{-3})\) with NaClO₄ \((c = 2.15 \times 10^{-3} \text{ mol dm}^{-3})\) in acetonitrile. \(l = 1 \text{ cm}; t = (25.0 \pm 0.1) ^\circ\text{C}; n(\text{Na}^+) / n(1) = 0\) (top curve) – 2.40 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 277 nm on \(n(\text{Na}^+) / n(1)\) ratio.

Figure S8. (a) Spectrophotometric titration of 2 \((c = 2.70 \times 10^{-4} \text{ mol dm}^{-3})\) with NaClO₄ \((c = 2.2 \times 10^{-3} \text{ mol dm}^{-3})\) in acetonitrile. \(l = 1 \text{ cm}; t = (25.0 \pm 0.1) ^\circ\text{C}; n(\text{Na}^+) / n(2) = 0\) (top curve) – 2.54 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on \(n(\text{Na}^+) / n(2)\) ratio.
Figure S9. (a) Spectrophotometric titration of 2 \((c = 2.26 \times 10^{-4} \text{ mol dm}^{-3})\) with KCIO4 \((c = 2.34 \times 10^{-3} \text{ mol dm}^{-3})\) in acetonitrile. \(l = 1 \text{ cm}; \ t = (25.0 \pm 0.1) ^\circ \text{C}; \ n(\text{K}^+) / n(2) = 0\) (top curve) – 2.18 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on \(n(\text{K}^+) / n(2)\) ratio.

Figure S10. (a) Spectrophotometric titration of 2 \((c = 2.70 \times 10^{-4} \text{ mol dm}^{-3})\) with RbNO3 \((c = 1.86 \times 10^{-3} \text{ mol dm}^{-3})\) in acetonitrile. \(l = 1 \text{ cm}; \ t = (25.0 \pm 0.1) ^\circ \text{C}; \ n(\text{Rb}^+) / n(2) = 0\) (top curve) – 3.09 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on \(n(\text{Rb}^+) / n(2)\) ratio.
Figure S11. (a) Spectrophotometric titration of $2$ ($c = 1.62 \times 10^{-4}$ mol dm$^{-3}$) with CsNO$_3$ ($c = 1.90 \times 10^{-3}$ mol dm$^{-3}$) in acetonitrile. $l = 1$ cm; $t = (25.0 \pm 0.1) ^\circ C$; $n$(Cs$^+$) / $n$(2) = 0 (top curve) – 6.15 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on $n$(Cs$^+$) / $n$(2) ratio. ■ experimental; – calculated.

Figure S12. (a) Spectrophotometric titration of $1$ ($c = 2.17 \times 10^{-4}$ mol dm$^{-3}$) with Mg(ClO$_4$)$_2$ ($c = 1.86 \times 10^{-3}$ mol dm$^{-3}$) in acetonitrile. $l = 1$ cm; $t = (25.0 \pm 0.1) ^\circ C$; $n$(Mg$^{2+}$) / $n$(1) = 0 (top curve) – 2.57 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 277 nm on $n$(Mg$^{2+}$) / $n$(1) ratio.
Figure S13. (a) Spectrophotometric titration of 2 (c = 2.06 × 10^{-4} mol dm^{-3}) with Mg(ClO₄)₂ (c = 1.99 × 10^{-3} mol dm^{-3}) in acetonitrile. l = 1 cm; t = (25.0 ± 0.1) °C; n(Mg²⁺) / n(2) = 0 (top curve) – 2.23 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on n(Mg²⁺) / n(2) ratio.

Figure S14. (a) Spectrophotometric titration of 1 (c = 1.89 × 10^{-4} mol dm^{-3}) with Ca(ClO₄)₂ (c = 2.03 × 10^{-3} mol dm^{-3}) in acetonitrile. l = 1 cm; t = (25.0 ± 0.1) °C; n(Li⁺) / n(1) = 0 (top curve) – 3.10 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 277 nm on n(Ca²⁺) / n(1) ratio.
Figure S15. (a) Spectrophotometric titration of 2 (c = 2.70 × 10⁻⁴ mol dm⁻³) with Ca(ClO₄)₂ (c = 2.06 × 10⁻³ mol dm⁻³) in acetonitrile. l = 1 cm; t = (25.0 ± 0.1) °C; n(Ca²⁺) / n(2) = 0 (top curve) – 2.33 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on n(Ca²⁺) / n(2) ratio.

Figure S16. (a) Spectrophotometric titration of 1 (c = 1.89 × 10⁻⁴ mol dm⁻³) with Sr(ClO₄)₂ (c = 2.15 × 10⁻³ mol dm⁻³) in acetonitrile. l = 1 cm; t = (25.0 ± 0.1) °C; n(Sr²⁺) / n(1) = 0 (top curve) – 2.39 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 277 nm on n(Sr²⁺) / n(1) ratio.
Figure S17. (a) Spectrophotometric titration of \( \mathbf{2} \) \((c = 2.70 \times 10^{-4} \text{ mol dm}^{-3})\) with \( \text{Sr(ClO}_4\text{)}_2 \) \((c = 2.15 \times 10^{-3} \text{ mol dm}^{-3})\) in acetonitrile. \( l = 1 \text{ cm}; t = (25.0 \pm 0.1) \text{ °C}; n(\text{Sr}^{2+})/n(\mathbf{2}) = 0 \) (top curve) – 3.19 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on \( n(\text{Sr}^{2+})/n(\mathbf{2}) \) ratio.

Figure S18. (a) Spectrophotometric titration of \( \mathbf{2} \) \((c = 3.24 \times 10^{-4} \text{ mol dm}^{-3})\) with \( \text{Ba(ClO}_4\text{)}_2 \) \((c = 1.80 \times 10^{-3} \text{ mol dm}^{-3})\) in acetonitrile. \( l = 1 \text{ cm}; t = (25.0 \pm 0.1) \text{ °C}; n(\text{Ba}^{2+})/n(\mathbf{2}) = 0 \) (top curve) – 1.94 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on \( n(\text{Ba}^{2+})/n(\mathbf{2}) \) ratio.
Figure S19. Conductometric titration of LiClO$_4$ ($c = 1.78 \times 10^{-4}$ mol dm$^{-3}$) with 1 ($c = 1.90 \times 10^{-3}$ mol dm$^{-3}$) in acetonitrile; $t = (25.0 \pm 0.1)$ °C.

Figure S20. Conductometric titration of LiClO$_4$ ($c = 1.09 \times 10^{-4}$ mol dm$^{-3}$) with 2 ($c = 1.23 \times 10^{-3}$ mol dm$^{-3}$) in acetonitrile; $t = (25.0 \pm 0.1)$ °C.
Figure S21. Conductometric titration of NaClO$_4$ \((c = 1.53 \times 10^{-4} \text{ mol dm}^{-3})\) with 1 (\(c = 1.90 \times 10^{-3} \text{ mol dm}^{-3}\)) in acetonitrile; \(t = (25.0 \pm 0.1) ^\circ\text{C}\).

Figure S22. Conductometric titration of NaClO$_4$ \((c = 6.33 \times 10^{-5} \text{ mol dm}^{-3})\) with 2 (\(c = 9.96 \times 10^{-4} \text{ mol dm}^{-3}\)) in acetonitrile; \(t = (25.0 \pm 0.1) ^\circ\text{C}\).
Figure S23. Conductometric titration of KClO$_4$ ($c = 1.03 \times 10^{-4} \text{ mol dm}^{-3}$) with 2 ($c = 9.57 \times 10^{-4} \text{ mol dm}^{-3}$) in acetonitrile; $t = (25.0 \pm 0.1) \degree C$.

Figure S24. Conductometric titration of RbClO$_4$ ($c = 9.43 \times 10^{-5} \text{ mol dm}^{-3}$) with 2 ($c = 9.69 \times 10^{-4} \text{ mol dm}^{-3}$) in acetonitrile; $t = (25.0 \pm 0.1) \degree C$. 
Figure S25. Conductometric titration of CsNO₃ \((c = 9.59 \times 10^{-5} \text{ mol dm}^{-3})\) with 2 \((c = 1.39 \times 10^{-3} \text{ mol dm}^{-3})\) in acetonitrile; \(t = (25.0 \pm 0.1) ^\circ\text{C}\). ■ experimental; – calculated.

Figure S26. Conductometric titration of Mg(ClO₄)₂ \((c = 1.81 \times 10^{-4} \text{ mol dm}^{-3})\) with 1 \((c = 1.90 \times 10^{-3} \text{ mol dm}^{-3})\) in acetonitrile; \(t = (25.0 \pm 0.1) ^\circ\text{C}\).
Figure S27. Conductometric titration of Mg(ClO$_4$)$_2$ ($c = 9.58 \times 10^{-5}$ mol dm$^{-3}$) with 2 ($c = 1.33 \times 10^{-3}$ mol dm$^{-3}$) in acetonitrile; $t = (25.0 \pm 0.1)$ °C.

Figure S28. Conductometric titration of Ca(ClO$_4$)$_2$ ($c = 1.81 \times 10^{-4}$ mol dm$^{-3}$) with 1 ($c = 1.90 \times 10^{-3}$ mol dm$^{-3}$) in acetonitrile; $t = (25.0 \pm 0.1)$ °C.
Figure S29. Conductometric titration of Ca(ClO₄)₂ (c = 9.62 × 10⁻⁵ mol dm⁻³) with 2 (c = 1.33 × 10⁻³ mol dm⁻³) in acetonitrile; t = (25.0 ± 0.1) °C.

Figure S30. Conductometric titration of Sr(ClO₄)₂ (c = 1.61 × 10⁻⁴ mol dm⁻³) with 1 (c = 1.90 × 10⁻³ mol dm⁻³) in acetonitrile; t = (25.0 ± 0.1) °C.
Figure S31. Conductometric titration of Sr(ClO$_4$)$_2$ ($c = 8.43 \times 10^{-5}$ mol dm$^{-3}$) with 2 ($c = 1.33 \times 10^{-3}$ mol dm$^{-3}$) in acetonitrile; $t = (25.0 \pm 0.1)$ °C.

Figure S32. Conductometric titration of Ba(ClO$_4$)$_2$ ($c = 1.72 \times 10^{-4}$ mol dm$^{-3}$) with 1 ($c = 1.90 \times 10^{-3}$ mol dm$^{-3}$) in acetonitrile; $t = (25.0 \pm 0.1)$ °C.
Figure S33. Conductometric titration of Ba(ClO$_4$)$_2$ ($c = 8.99 \times 10^{-5}$ mol dm$^{-3}$) with 2 ($c = 1.33 \times 10^{-3}$ mol dm$^{-3}$) in acetonitrile; $t = (25.0 \pm 0.1)$ °C.

Figure S34. Potentiometric titration of NaClO$_4$ ($c = 6.89 \times 10^{-5}$ mol dm$^{-3}$) with 2 ($c = 7.08 \times 10^{-4}$ mol dm$^{-3}$) in acetonitrile. $V_0$(NaClO$_4$) = 30.3 cm$^3$ $I_c = 0.01$ mol dm$^{-3}$ ((C$_2$H$_5$)$_4$NCIO$_4$); $t = (25.0 \pm 0.1)$ °C.
Figure S35. (a) Spectrophotometric titration of 2 ($c = 2.28 \times 10^{-4} \text{ mol dm}^{-3}$) with LiClO$_4$ ($c = 1.97 \times 10^{-3} \text{ mol dm}^{-3}$) in methanol. $l = 1 \text{ cm}; t = (25.0 \pm 0.1) ^\circ \text{C}; n(\text{Li}^+) / n(2) = 0$ (top curve) – 2.68 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 280 nm on $n(\text{Li}^+) / n(2)$ ratio.

Figure S36. (a) Spectrophotometric titration of 1 ($c = 2.22 \times 10^{-4} \text{ mol dm}^{-3}$) with NaClO$_4$ ($c = 3.17 \times 10^{-3} \text{ mol dm}^{-3}$) in methanol. $l = 1 \text{ cm}; t = (25.0 \pm 0.1) ^\circ \text{C}; n(\text{Na}^+) / n(1) = 0$ (top curve) – 5.36 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 279 nm on $n(\text{Na}^+) / n(1)$ ratio. ■ experimental; – calculated.
Figure S37. (a) Spectrophotometric titration of 2 ($c = 1.28 \times 10^{-4} \text{ mol dm}^{-3}$) with NaClO$_4$ ($c = 2.39 \times 10^{-3} \text{ mol dm}^{-3}$) in methanol. $l = 1 \text{ cm}; t = (25.0 \pm 0.1) \ ^\circ \text{C}; n(\text{Na}^+) / n(2) = 0$ (top curve) – 3.18 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 280 nm on $n(\text{Na}^+) / n(2)$ ratio.

Figure S38. (a) Spectrophotometric titration of 2 ($c = 1.28 \times 10^{-4} \text{ mol dm}^{-3}$) with KClO$_4$ ($c = 3.16 \times 10^{-3} \text{ mol dm}^{-3}$) in methanol. $l = 1 \text{ cm}; t = (25.0 \pm 0.1) \ ^\circ \text{C}; n(\text{K}^+) / n(2) = 0$ (top curve) – 4.21 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 280 nm on $n(\text{K}^+) / n(2)$ ratio.
Figure S39. (a) Spectrophotometric titration of 2 \((c = 2.28 \times 10^{-4} \text{ mol dm}^{-3})\) with RbNO₃ \((c = 1.17 \times 10^{-3} \text{ mol dm}^{-3})\) in methanol. \(l = 1 \text{ cm}; t = (25.0 \pm 0.1) ^\circ \text{C}; n(\text{Rb}^+) / n(2) = 0\) (top curve) – 3.60 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 280 nm on \(n(\text{Rb}^+) / n(2)\) ratio. ■ experimental; – calculated.

Figure S40. (a) Spectrophotometric titration of 2 \((c = 2.44 \times 10^{-4} \text{ mol dm}^{-3})\) with CsNO₃ \((c = 3.95 \times 10^{-2} \text{ mol dm}^{-3})\) in methanol. \(l = 1 \text{ cm}; t = (25.0 \pm 0.1) ^\circ \text{C}; n(\text{Rb}^+) / n(2) = 0\) (top curve) – 89.2 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 275 nm on \(n(\text{Cs}^+) / n(2)\) ratio. ■ experimental; – calculated.
Figure S41. (a) Spectrophotometric titration of 1 (c = 1.95 × 10⁻⁴ mol dm⁻³) with Ca(ClO₄)₂ (c = 2.16 × 10⁻³ mol dm⁻³) in methanol. l = 1 cm; t = (25.0 ± 0.1) °C; n(Ca²⁺) / n(1) = 0 (top curve) – 2.77 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 275 nm on n(Ca²⁺) / n(1) ratio.

Figure S42. (a) Spectrophotometric titration of 2 (c = 1.75 × 10⁻⁴ mol dm⁻³) with Ca(ClO₄)₂ (c = 2.16 × 10⁻³ mol dm⁻³) in methanol. l = 1 cm; t = (25.0 ± 0.1) °C; n(Ca²⁺) / n(2) = 0 (top curve) – 3.58 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 275 nm on n(Ca²⁺) / n(2) ratio.
Figure S43. (a) Spectrophotometric titration of 2 (c = $1.78 \times 10^{-4}$ mol dm$^{-3}$) with Sr(ClO$_4$)$_2$ (c = $2.20 \times 10^{-3}$ mol dm$^{-3}$) in methanol. l = 1 cm; t = (25.0 ± 0.1) °C; n(Sr$^{2+}$) / n(2) = 0 (top curve) – 1.71 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 280 nm on n(Sr$^{2+}$) / n(2) ratio.

Figure S44. (a) Spectrophotometric titration of 1 (c = $2.06 \times 10^{-4}$ mol dm$^{-3}$) with Ba(ClO$_4$)$_2$ (c = $4.52 \times 10^{-3}$ mol dm$^{-3}$) in methanol. l = 1 cm; t = (25.0 ± 0.1) °C; n(Ba$^{2+}$) / n(1) = 0 (top curve) – 9.44 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 275 nm on n(Ba$^{2+}$) / n(1) ratio. ■ experimental; – calculated.
Figure S45. (a) Spectrophotometric titration of 2 ($c = 1.28 \times 10^{-4} \text{ mol dm}^{-3}$) with Ba(ClO$_4$)$_2$ ($c = 2.21 \times 10^{-3} \text{ mol dm}^{-3}$) in methanol. $l = 1 \text{ cm}; t = (25.0 \pm 0.1) ^\circ \text{C}; n(\text{Ba}^{2+}) / n(2) = 0$ (top curve) – 3.98 (bottom curve); the spectra are corrected for dilution. (b) Dependence of absorbance at 275 nm on $n(\text{Ba}^{2+}) / n(2)$ ratio.

Figure S46. Conductometric titration of NaClO$_4$ ($c = 7.82 \times 10^{-5} \text{ mol dm}^{-3}$) with 1 ($c = 2.22 \times 10^{-3} \text{ mol dm}^{-3}$) in methanol; $t = (25.0 \pm 0.1) ^\circ \text{C}$. ■ experimental; – calculated.
Figure S47. Conductometric titration of Mg(ClO$_4$)$_2$ ($c = 9.11 \times 10^{-5}$ mol dm$^{-3}$) with 1 ($c = 2.03 \times 10^{-3}$ mol dm$^{-3}$) in methanol; $t = (25.0 \pm 0.1)$ °C. ■ experimental; – calculated.

Figure S48. Conductometric titration of Sr(ClO$_4$)$_2$ ($c = 1.35 \times 10^{-4}$ mol dm$^{-3}$) with 1 ($c = 1.92 \times 10^{-3}$ mol dm$^{-3}$) in methanol; $t = (25.0 \pm 0.1)$ °C. ■ experimental; – calculated.
Figure S49. Conductometric titration of Ba(ClO$_4$)$_2$ ($c = 1.41 \times 10^{-4}$ mol dm$^{-3}$) with 1 ($c = 1.92 \times 10^{-3}$ mol dm$^{-3}$) in methanol; $t = (25.0 \pm 0.1)$ °C. ■ experimental; – calculated.

Figure S50. Conductometric titration of LiClO$_4$ ($c = 1.05 \times 10^{-4}$ mol dm$^{-3}$) with 2 ($c = 2.33 \times 10^{-3}$ mol dm$^{-3}$) in methanol; $t = (25.0 \pm 0.1)$ °C. ■ experimental; – calculated.
Figure S51. Conductometric titration of RbNO₃ \( (c = 1.07 \times 10^{-4} \text{ mol dm}^{-3}) \) with 2 \( (c = 2.33 \times 10^{-3} \text{ mol dm}^{-3}) \) in methanol; \( t = (25.0 \pm 0.1) \degree \text{C} \). ■ experimental; – calculated.

Figure S52. Conductometric titration of Ca(ClO₄)₂ \( (c = 1.96 \times 10^{-4} \text{ mol dm}^{-3}) \) with 1 \( (c = 1.92 \times 10^{-3} \text{ mol dm}^{-3}) \) in methanol; \( t = (25.0 \pm 0.1) \degree \text{C} \).
Figure S53. Conductometric titration of NaClO$_4$ ($c = 9.44 \times 10^{-5}$ mol dm$^{-3}$) with 2 ($c = 2.12 \times 10^{-3}$ mol dm$^{-3}$) in methanol; $t = (25.0 \pm 0.1)$ °C.

Figure S54. Conductometric titration of KClO$_4$ ($c = 1.09 \times 10^{-4}$ mol dm$^{-3}$) with 2 ($c = 1.21 \times 10^{-3}$ mol dm$^{-3}$) in methanol; $t = (25.0 \pm 0.1)$ °C.
Figure S55. Conductometric titration of Ca(ClO$_4$)$_2$ ($c = 1.08 \times 10^{-4}$ mol dm$^{-3}$) with 2 ($c = 2.33 \times 10^{-3}$ mol dm$^{-3}$) in methanol; $t = (25.0 \pm 0.1)$ °C.

Figure S56. Conductometric titration of Sr(ClO$_4$)$_2$ ($c = 1.86 \times 10^{-4}$ mol dm$^{-3}$) with 2 ($c = 2.33 \times 10^{-3}$ mol dm$^{-3}$) in methanol; $t = (25.0 \pm 0.1)$ °C.
Figure S57. Conductometric titration of $\text{Ba(ClO}_4\text{)}_2$ ($c = 1.02 \times 10^{-4}\text{ mol dm}^{-3}$) with 2 ($c = 2.33 \times 10^{-3}\text{ mol dm}^{-3}$) in methanol; $t = (25.0 \pm 0.1)\degree\text{C}$. 