

Supplementary material to:

C. Billing and I. Cukrowski, *S. Afr. J. Chem.*, 2009, **62**, 168–178.

For electrodes that failed the performance test, the glass membranes were regenerated by leaching the membrane with HF; this improved the performance of the electrode which once again displayed less curvature in the basic region. The procedure used was to treat the glass membrane with 40 % HF solution for about 5 s and then rinse it in a 1:1 HCl:H₂O solution for

about 10 s. The electrode was then immersed in deionized water at 50 °C for 5 h before the filling solution was removed and replenished with fresh 3 mol L⁻¹ KCl. The electrode was then left to stand in the 3 mol L⁻¹ KCl storage solution for at least 24 h before use.

Table S1 Response slope and E° obtained from linear GE calibration data involving the titration of HNO₃ with either NaOH or KOH, at 25 °C.

	Calibration solutions										
	HNO ₃ + NaOH				Average	Std. dev.	HNO ₃ + KOH			Average	Std. dev.
Acid and base molarity	0.005	0.01	0.5	0.5 ^a	–	–	0.01	0.5	0.5 ^a	–	–
Total pH range	2.3–11.0	2.0–11.3	0.3–13.0	0.6–12.8	–	–	2.0–11.3	0.3–13.0	0.6–12.8	–	–
Response slope/ (mV/pH unit)	-58.65 (±0.006)	-58.64 (±0.01)	-58.47 (±0.01)	-58.55 (±0.007)	-58.58	0.08	-59.01 (±0.02)	-59.15 (±0.005)	-59.18 (±0.005)	-59.11	0.09
E° /mV	408.72 (±0.05)	409.50 (±0.09)	406.70 (±0.01)	407.17 (±0.06)	408.02	1.31	403.50 (±0.1)	402.43 (±0.05)	402.59 (±0.04)	402.84	0.58

^a Some data points (where largest curvature was observed) were removed – for details, see the text.

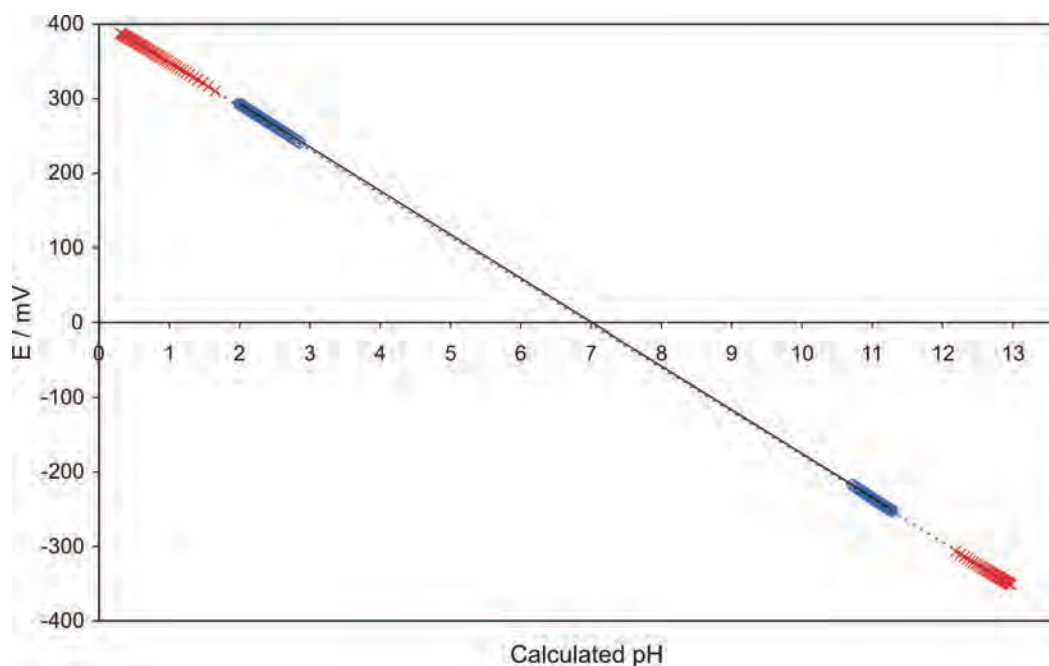


Figure S1 GE calibration data (glass electrode potential *versus* calculated pH) collected from two titrations using the same glass electrode and standardized solutions, that of 0.5 or 0.01 mol L⁻¹ HNO₃ by 0.5 mol L⁻¹ (×, dashed line) and 0.01 mol L⁻¹ (○, solid line trace) NaOH, respectively.

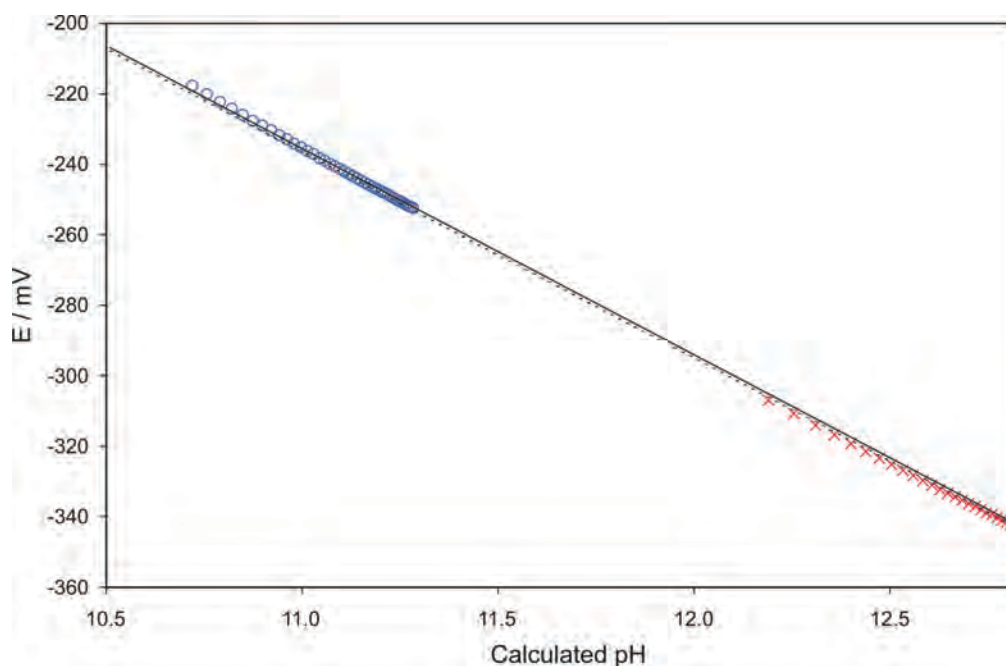


Figure S2 Basic region of titrations seen in Fig. S1. Calibration plot obtained from titration involving $0.01 \text{ mol L}^{-1} \text{ HNO}_3$ and NaOH standardized solutions (circles, solid line trace) was extrapolated to the entire pH range.

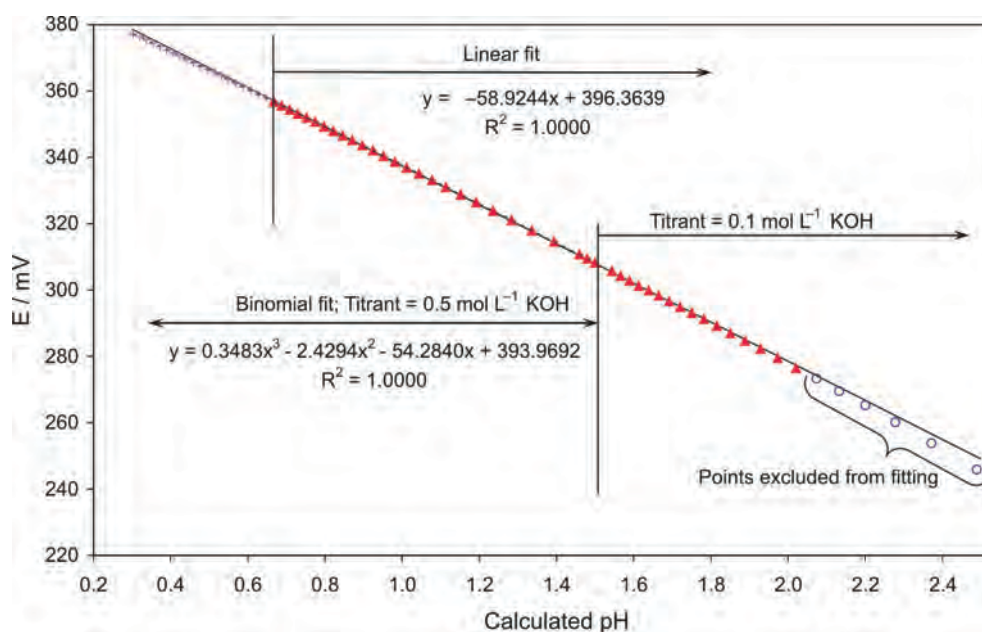


Figure S3 Treatment of data collected from titrations by 0.5 and $0.1 \text{ mol L}^{-1} \text{ KOH}$, used in calibration of a glass electrode involving linear and binomial functions – acidic region. Triangles – acidic data points used for fitting a linear function (solid line trace obtained with inclusion of basic data points). All points in pH range between 0.3 and 1.5 (crosses and triangles) were used for fitting binomial function. Points that were excluded from calibration of glass electrode are shown as circles.

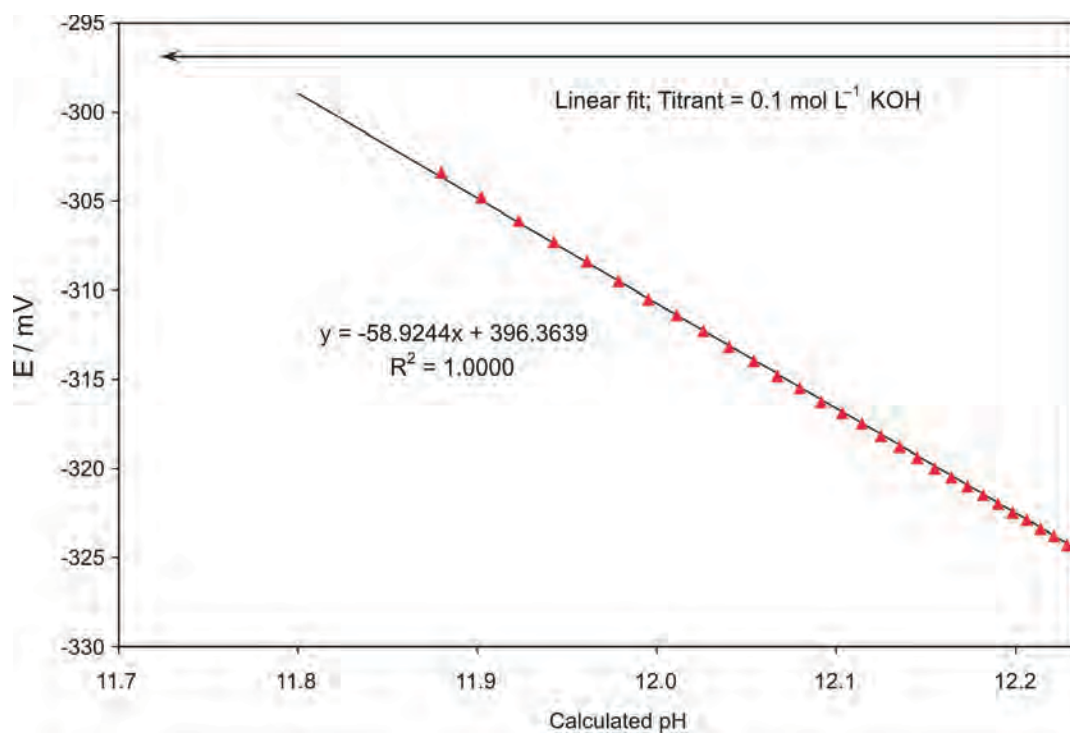


Figure S4 Treatment of data collected from titrations by 0.5 and 0.1 mol L⁻¹ KOH, used in calibration of a glass electrode involving linear and binomial functions –basic region. Triangles –basic data points used for fitting a linear function (solid line trace obtained with inclusion of acidic data points).