Molybdenum Indicator Electrode in Silver-Halide Titrations

L.A. Kamel, M.E. Ibrahim, N.S. Mohamed, M.M.B. El-Sabbah and A.S. Abdellah

Department of Chemistry, Faculty of Science, Al-Azhar University, Nasr City Cairo, Egypt

Sharp end points were obtained in the titration of Br^- and I^- with Ag^+ using Mo/SCE electorde combination. However no inflexion was recorded in the titration of Cl^-. The end points using Mo/Pt is signified by minimum on the titration curve and can easily escape from the analyst's observation. The use Mo/Ag bimetallic combination for halide precipitation titration is preferable.

Argentometric titrations of halides can be carried out with several methods of end point detection. Potentiometric determination can be carried out using Ag/Ag^+ indicator electrode with SCE, or halide ion electrode with SCE. Halide selective electrodes made of silver telluride with a small amount of silver halide deposited on its surface were used by Mirkin and Nemchenko [1]. The use of Mo/Ag system in strong base titrations was investigated by Athavale in non aqueous media [2].

The present study has two objectives. The first is the examination of Mo as an indicator electrode in Ag-halide precipitation titrations. The second is comparing the Pt/Mo, Ag/Mo and Ag/Pt bimetallic combination for use in these titrations.

EXPERIMENTAL

The study involves the titration of NaCl, KBr and KI with $AgNO_3$. All solutions were prepared from A.R. materials and doubly distilled water, and were standardised according to recommended procedure [3].

The potential of the Mo electrode was measured, relative to the SCE during the course of titration. The potential of Pt/SCE was simultaneously measured for comparison.

Also were measured the potentials of the Pt/Mo, Ag/Mo and Ag/Pt bimetallic combiantions. The measurements were carried out at (25 ± 2°C).

RESULTS AND DISCUSSION

Inspection of the titration curves reveals that in the case of Cl^- no distinct end point was obtained with Mo/SCE and Mo/Pt systmes. An inflexion, albeit not sharp, of about 100 mV was recorded with Pt/SCE at the end point of Ag^+/Cl^- titration, No meaningful titration is possible with this.

A sudden increase in potential at end points was obtained in the titrations of both Br^- and I^- using Pt/SCE and Mo/SCE systmes. In the titration of Br^-, this increase amounts to ∽ 140 and 80 mV with Pt/SCE and Mo/SCE systems respectively However in the titration of I solution with the same titrant, a larger potential jump amounting to 160 and 130 mV respectively were recorded This increase in the potential jumps in the case of iodide may be accounted for by the difference in the solubility products of AgI and AgBr [3].

Using the Mo/Pt bimetallic combination, the end point was signified by a sharp minimum in the case of Br^- and I^-. In the case of Cl^-, the end point is not detectable from the titration curves, using these electrode combination. In all these cases the end points appearing as minimum can easily escape from the analyst observation. So Ag electrode was used as one of the bimetallic electrode. The titration experiments of Cl^- and Br^- solutions were repeated with Ag/Mo as well as Ag/Pt electrodes. S shaped curves with sharp potential inflexions of 150 - 250 mV were recorded at the theoretical end points.

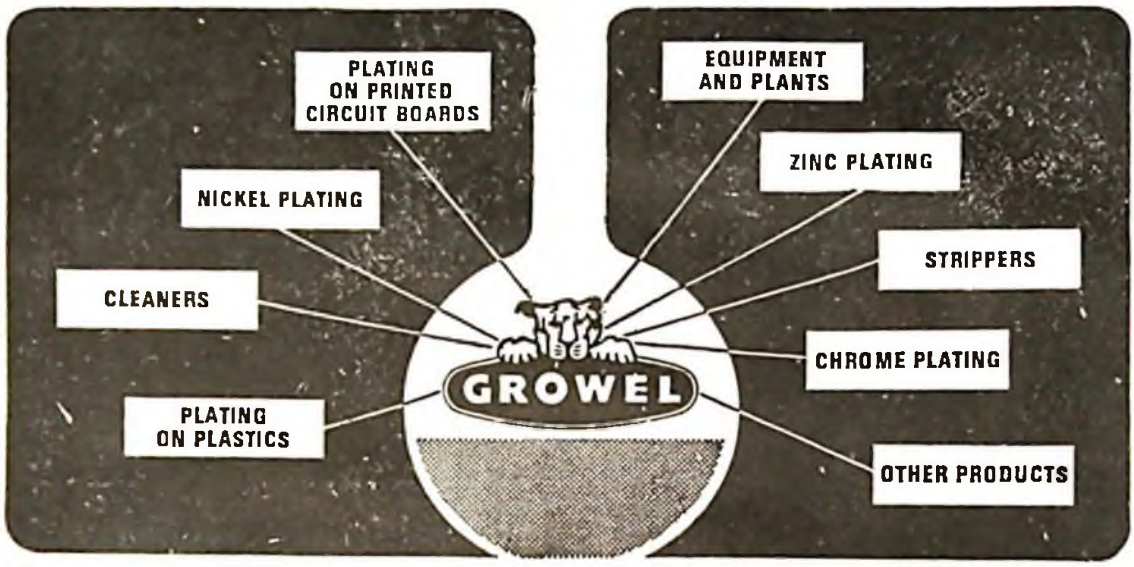
Calculation shows that the end points observed in every case agrees with the calculated value. However the use of Mo/Ag combination in these titrations is preferable. Since normal S shaped titration curves with sharp end points can be obtained and the end points easily determined therfrom. Moreover one can avoid the use of SCE with its salt bridge.

REFERENCES

1. V.A. Mirkin, M.A.Ilyushchenko, I.V. Nemchenko, *Zh. Anal. Khim.*, 35(2) (1980) 266-9 (Russ), C.A. 93(1980) 184135.
2. V.T. Athavale, M.R. Dhaneshwar and R.C. Dhaneshwar, *Ind. J. Chem.*, 7(1969) 602.
3. Vogel's *Textbook of Quantitative Inorganic Anlysis* ELBS and Longman (1978).

SCIENTIFIC SOLUTIONS TO ALL METAL FINISHING AND PLATING PROBLEMS FROM ONE SOURCE:

GRAUER & WEIL



Cleaners:
The GINBOND series of soak and electrolytic cleaners developed under the technical guidance of M/s. Enthone Inc., U.S.A.
Also available: Steelex K-20 and K-30 process for wide and versatile applications.

Nickel Plating:
The famous Superglo Bright Nickel process being widely used—known for its outstanding performance at economical cost.
Other processes like Electroless Nickel Plating developed for special applications.

Chrome Plating:
Grobrite Chrome—high efficiency decorative chromium plating process.
Durobrite self-regulating high speed Chrome process for decorative/hard chromium plating. Imparts excellent lustre even at high thicknesses.

Zinc Plating:
The renowned High Cyanide Bright Zinc process Zincbrite 16 for use in Vat/Barrel plating. Also available: low cyanide and non-cyanide bright zinc system together with very efficient and decorative conversion coatings developed under the technical guidance of M/s Enthone Inc., U.S.A

Plating on Plastics:
Latest technology incorporating no re-rack systems and high speed electroless plating with complete process for plating on plastics being offered under the technical guidance of M/s. Enthone Inc., U.S.A.

Plating on Printed Circuit Boards:
Complete process for plating on single or multi-layered double-sided printed circuit boards including thru-hole plating, available under the technical guidance of M/s. Enthone Inc., U.S.A.

Strippers:
The Metstrip range of metal strippers renowned for their operational advantages.

Other Products:
Cupracid Bright Acid Copper, Alkaline Copper, Acid Tin, Electroless Tin, Blackening and Colouring, Precious Metal Plating, Plating on Aluminium, Polishing and Buffing compositions, basic chemicals like Nickel Sulphate, Nickel Carbonate, Nickel Sulphamate etc. and practically the entire range of chemicals required for Metal Finishing.

Equipment and Plants:
Manual, semi-automatic and fully automatic plants, manufactured under the technical guidance of M/s. Langbein Pfanhauser Werke, A.G., West Germany are also available.

GROWEL

GRAUER & WEIL (INDIA) LIMITED

Registered Office: Sukh Sagar, S. Patkar Marg, BOMBAY 400 007 • Telephone: 359581
Grams: WISHWELL • Telex: 011-3091

Branch Offices: Ahad Mansion, 1st Floor, 740, Mount Road, Madras 600 002 • Telephone: 89114

Growel House, W-140, Greater Kailash-1, New Delhi 110 048 • Telephone: 694838

9-1-48/1, 1st Floor, Sarojini Devi Road, Secunderabad 500 003

Distributors: Pai and Pai Enterprises, 29, Second Block, Chord Road, Rajajinagar, Bangalore 560 010 • Phone: 80685 • Grams: AERO

Nandan Sales, Near Old Sabzi Mandi, G.T. Road, Ludhiana • Phone: 24695

Stockists: Malliga Metals, 15/49 Variety Hall Road, Coimbatore 641 001 • Phone: 26654

Mahavir Trading Company, Shop No. 1, Targadacoad, Kalupur, Ahmedabad 380 001

M/s. Sai Tools & Hardwares, 3-8/6 Balanagar Cross Road, Opp. H.P. Petrol Pump, Hyderabad 500 037

CO.6.80