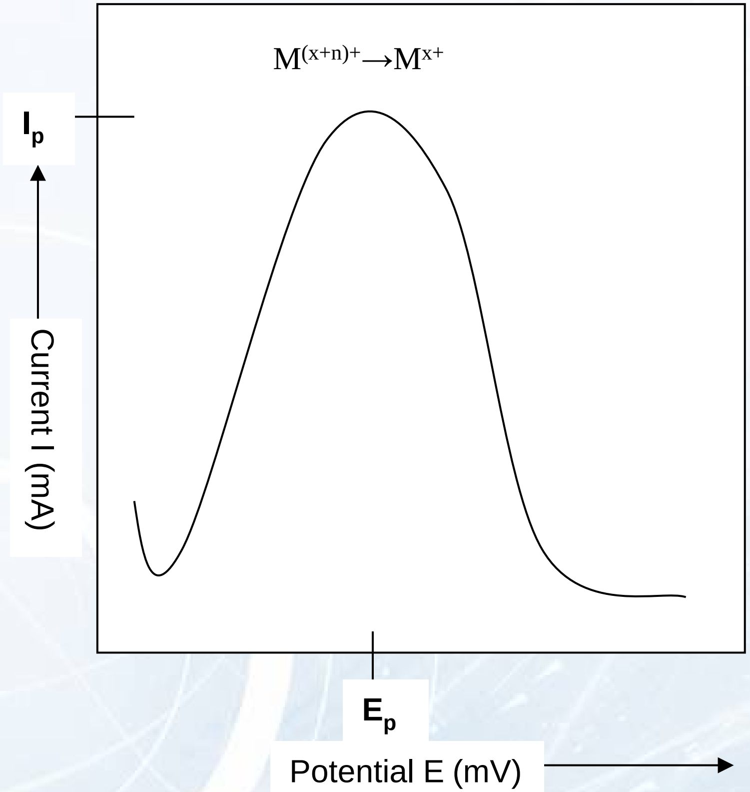
In previous voltammetry studies



Typical voltammogram (current-potential curve) in one glass melt doped with M determined by SWV using Pt crucible

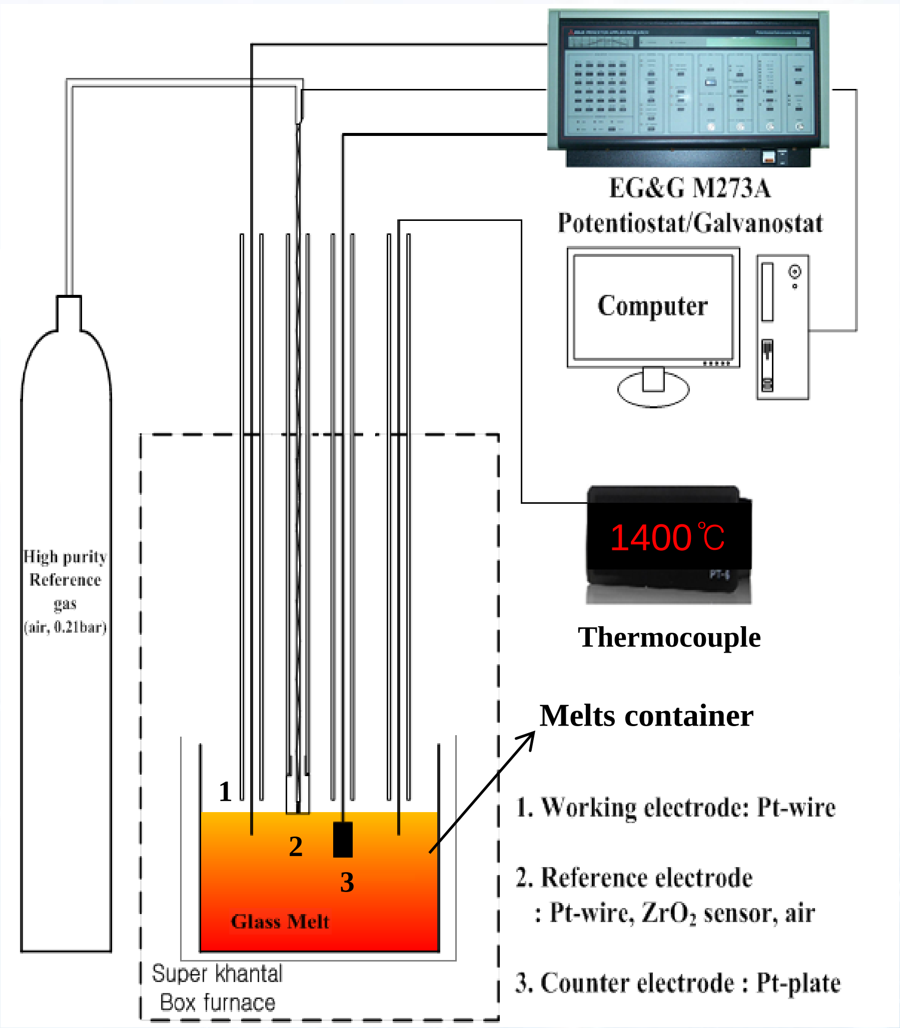
Nernst Equation:

$$\boldsymbol{Redox\ Ratio} = \frac{[M^{x+}]}{[M^{(x+n)+}]} = \frac{1}{P_{O_2}^{n/4}} \exp\left[\frac{n \cdot F \cdot E_P}{R_g \cdot T}\right]$$

P_{O_2}: oxygen activity, n: no. of transferred electron
F: Faraday constant

Instead of real oxygen activity, 0.21bar as P_{O2} irrespective of temperature is substituted to determine a redox ratio for M.
Therefore, the actual redox reaction of M in glass melt can not be understood correctly.

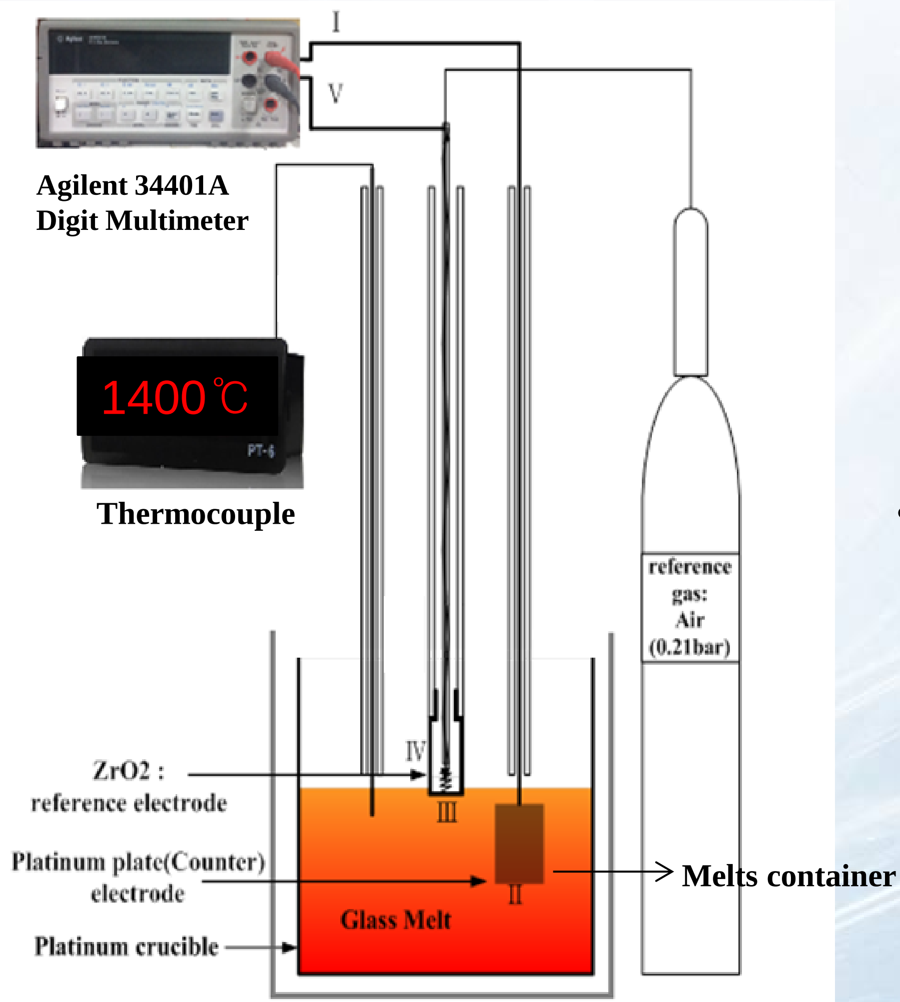
Square Wave Voltammetry



Schematic Diagram of Square Wave Voltammetry Cell

- **Parameters for SWV measurements**
  - initial potential, E_i : +200mV
  - final potential, E_{end} : -800mV
  - frequency of pulse, f : 50~500Hz
  - height of potential pulse, ΔE_b : 0.002V
  - step height, ΔE_p : 0.1V
  - temperature range : 1100ºC ~ 1400ºC
- **Crucible as melts container**
  - Platinum alloy (Pt/10Rh)
  - Silica glass (GE type 214)
  - Sintered alumina

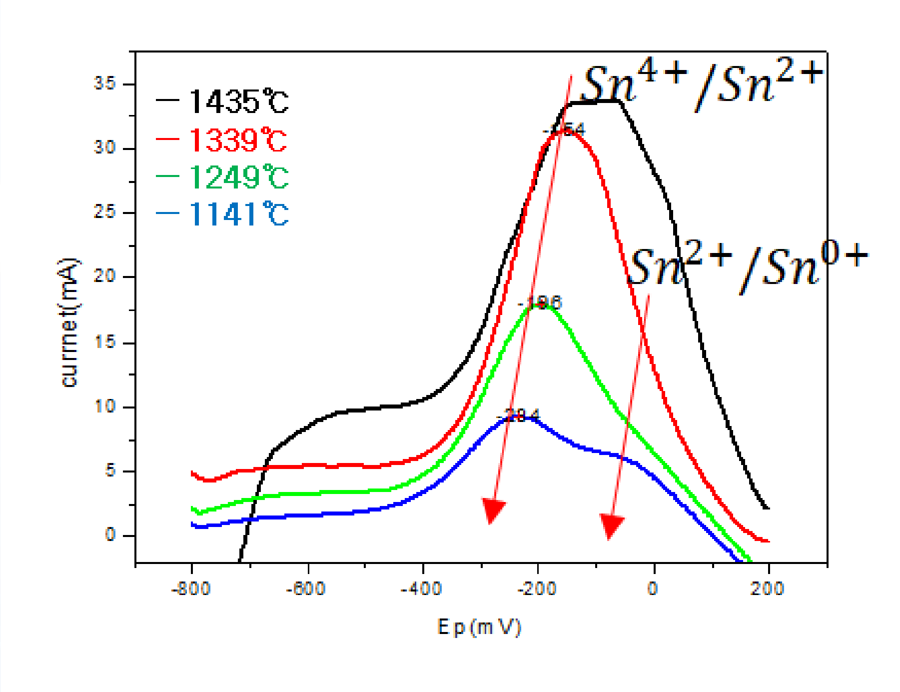
Oxygen activity

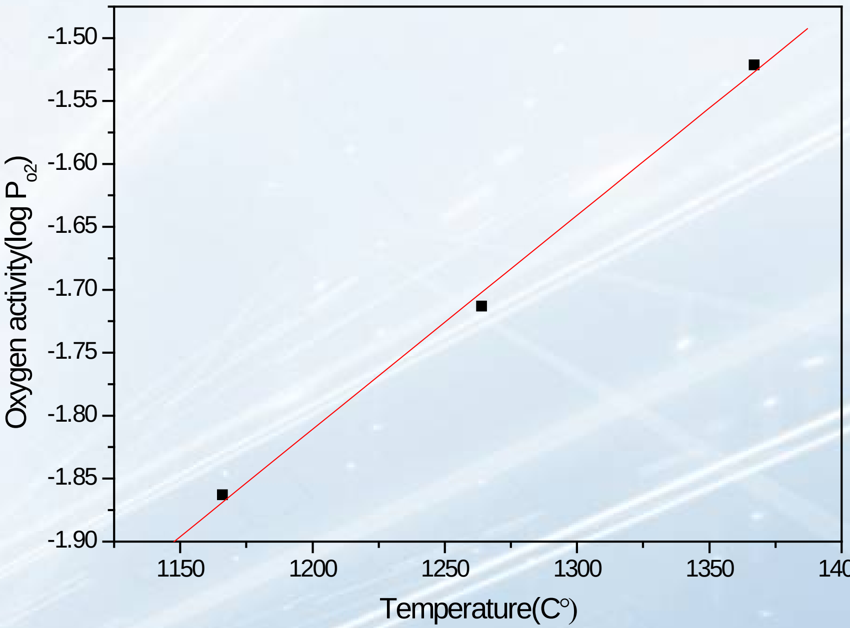


Schematic Diagram for Oxygen Activity Cell
Oxygen Activity Measurement

- **Parameters for P_{O_2} measurements**
  - time interval for measurement : 5 sec
  - measurement resolution : 0.00001
  - temperature range : 1100ºC ~ 1400ºC
  - time to reach an equilibrium state: 12 hrs
- **Crucible as melts container**
  - Silica glass (GE type 214)
  - Sintered alumina

Voltammogram & Temperature dependence of oxygen activity in alumina crucible





Redox ratio: %[Sn^{2+}]