COMPLEXATION TITRATION CALCULATION

SDSU CHEM 251

SAMPLE PROBLEM

Plot the titration curve for the titration of 25 mL of 8.40 mM $Ni(NO_3)_2$ with a 15 mM EDTA titrant. Note that the solution of nickel nitrate is buffered with 12.0 mM benzylamine hydrochloride and 53.6 mM benzylamine.

Determine the pNi^{2+} values after the following volumes of titrant have been added:

A) 0.00 mL of titrant
B) 3.75 mL of titrant
C) 9.35 mL of titrant
D) 14.00 mL of titrant
E) 16.50 mL of titrant

BEFORE THE EQUIVALENCE POINT

- Before the equivalence point the metal is in excess in solution.
- Due to the very high formation constants, a back reaction contribution to the total amount of free metal is insignificant.
- Simply determine the concentration of excess metal ion, keeping in mind the dilution that occurs with the titration.

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AT THE EQUIVALENCE POINT

- The dissociation of the complex, which varies in proportion to the pH, is the sole contributor to the free metal in solution.
- Determine the total concentration of metal-EDTA complex that has been formed, accounting for the dilution of the solution.
- Use the conditional formation constant to determine the amount of free EDTA and metal cation.

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PAST THE EQUIVALENCE POINT

- Past the equivalence point the excess of EDTA will gradually shift the equilibrium further towards complete complexation of the metal.
- Use the conditional formation constant, along with the diluted concentration of EDTA-metal complex and excess EDTA to determine the amount of free metal.
- The dissociation of the EDTA-metal complex does not need to be considered, due to the very large formation constants.

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