Chemical Equilibrium: $FeSCN^{2+}$

Purpose

To demonstrate LeChatelier's Principle.

Materials

0.20 M $Fe(NO_3)_3$ (lN 1 M HNO_3	0.002 M KSCN
Na_2HPO_4	0.20 M $AgNO_3$
0.2 M HCl	3 petri dishes
overhead projector	Eyedropper

Procedure

1. Cover the bottom of a petri dish with the KSCN solution.
2. Add a couple of drops of $Fe(NO_3)_2$ to the petri dish. Split the solution into three petri dishes.
3. To one dish add a bit of solid KSCN; to another add a couple drops of $Fe(NO_3)_2$; use the third as a standard. Notice that the two solutions get darker indicating that both reactants are present in solution – neither is limiting!
4. To one of the petri dishes, add a few crystals Na_2HPO_4. Notice the red color disappear.
5. To a different Petri dish, add a few drops of $AgNO_3$. Notice the red color disappear. To this same dish, add a few drops of HCl. Note the formation of a white solid, and the re-appearance of the red color.

Additional Information

1. The initial reaction is:

$$Fe^{3+} + SCN^- \leftrightarrow FeSCN^{2+}$$

(yellow) (colorless) (red)

2. Other reactions:

$Fe^{3+} + HPO_4^{2-} \leftrightarrow FeHPO_4^+$

$Ag^+ + SCN^- \leftrightarrow AgSCN$

$Ag^+ + Cl^- \leftrightarrow AgCl$

3. The Ag^+ reacts with the SCN^- driving the initial reaction to the left. The Cl^- then reacts with the Ag^+, which drive reaction b (in #2 above) to the left, producing more SCN^-. The SCN^- reacts with the Fe^{3+}, making more $FeSCN^{2+}$.

Additional Information

Waste should be collected in a properly labelled container with UI# 100937.

Reference

DeCoste, Don. University of Illinois, Urbana-Champaign.