

Reactions in Aqueous Solutions Where a Solid Forms

7.1-7.2

Predicting Whether a Rxn Will Occur

- “Driving forces” pull reactants to form products
 - Formation of solid
 - Formation of water
 - Transfer of electrons
 - Formation of a gas
- When 2+ chemicals brought together if any of these can occur, a chemical change likely to take place.
- Help us predict what products will form

Reactions Forming a Solid

- Precipitation- formation of a solid (precipitate)
- Ex. K_2CrO_4 (aq) (yellow) reacts w. $\text{Ba}(\text{NO}_3)_2$ (aq) (colorless)



Ionic Compounds in Solution

- When ionic compounds dissolve ions separate
- Know ions are present b/c conducts electricity (pure water doesn't)
- Strong electrolyte- when each unit of substance that dissolves in water produces separated ions
 - $\text{Ba}(\text{NO}_3)_2$ and K_2CrO_4 strong electrolytes

- Can write: $\text{K}_2\text{CrO}_4 + \text{Ba}(\text{NO}_3)_2 (\text{aq}) \rightarrow \text{products}$ or $2\text{K}^+ (\text{aq}) + \text{CrO}_4^{2-} (\text{aq}) + \text{Ba}^{2+} (\text{aq}) + 2\text{NO}_3^- (\text{aq}) \rightarrow \text{products}$
- *** Solid Compound has net charge = 0
- Possible products

- Which would produce yellow solid?
- KNO_3 (white solid) CrO_4^{2-} ion yellow so BaCrO_4 precipitate KNO_3 left in solution as ions
- $\text{K}_2\text{CrO}_4 + \text{Ba}(\text{NO}_3)_2 (\text{aq}) \rightarrow \text{BaCrO}_4 (\text{s}) + \text{KNO}_3 (\text{aq})$

Solubility Rules

1. Most nitrate salts = soluble
2. Most salts of Na^+ , K^+ , NH_4^+ = soluble
3. Most chloride salts = soluble
(exceptions: AgCl , PbCl_2 , Hg_2Cl_2)
4. Most sulfate salts = soluble
(exceptions: BaSO_4 , PbSO_4 , CaSO_4)
5. Most hydroxide compounds only slightly soluble
(exceptions: NaOH , KOH)
($\text{Ba}(\text{OH})_2$, $\text{Ca}(\text{OH})_2$ moderately soluble)
6. Most sulfide (S^{2-}), carbonate (CO_3^{2-}) and phosphate PO_4^{3-} only slightly soluble

Predicting Precipitates Steps

1. Write reactants as exist before rxn occurs
2. Consider various solids possible (exchange anions)
3. use solubility rules to decide whether solid forms
 - If not soluble- solid

Practice

Predict whether a solid will form when the following pairs of solutions are mixed. If so, identify the solid and write the balanced equation for the reaction.

1. $\text{Ba}(\text{NO}_3)_2$ (aq) and NaCl (aq)
2. Na_2S (aq) and $\text{Cu}(\text{NO}_3)_2$ (aq)
3. NH_4Cl (aq) and $\text{Pb}(\text{NO}_3)_2$ (aq)