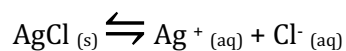


1. Common Ion Effect

Common Ion Effect

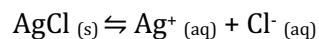
In a saturated solution, equilibrium is established between the **dissolving (increase solubility)** and **recrystallization (decrease solubility)** of a salt.



$$K_{sp} =$$

⇒ Which of the following will shift this equilibrium? If it shifts, in which direction will it shift?

- ❖ Add more  $\text{AgCl}_{(s)}$ ?
- ❖ Remove  $\text{AgCl}_{(s)}$ ? (not really an option since there is no  $\text{AgCl}_{(s)}$  to remove)
- ❖ Add  $\text{Ag}^{+}_{(aq)}$ ?
- ❖ Remove  $\text{Ag}^{+}_{(aq)}$ ?
- ❖ Add  $\text{Cl}^{-}_{(aq)}$ ?
- ❖ Remove  $\text{Cl}^{-}_{(aq)}$ ?



**INCREASE the Solubility of a Salt:**

- Dissolve more of the solid (if it exists)
- Equilibrium will shift to the \_\_\_\_\_.
- Rate of dissolving    Rate of recrystallization
- Can be accomplished by:
  - 
  -

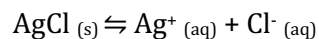
How do we REMOVE  $\text{Ag}^+_{(aq)}$  or  $\text{Cl}^-_{(aq)}$ ?

- ❖ To remove an ion from solution, we must find **another ion** to react with it.
- ❖ To remove  $\text{Ag}^+$ ...
- ❖ To remove  $\text{Cl}^-$ ...

Which of the following salts could be added to INCREASE the solubility of  $\text{AgCl}$ ?

$\text{AgCl}$        $\text{CaSO}_4$        $\text{KNO}_3$        $\text{ZnS}$        $\text{CaCl}_2$        $\text{AgBr}$        $\text{Mg}(\text{OH})_2$        $\text{NH}_4\text{CO}_3$

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**DECREASE the Solubility of a Salt:**

- Equilibrium will shift to the \_\_\_\_\_.
- Cause more solid to form.
- Rate of dissolving    Rate of recrystallization
- Can be accomplished by:
  - 
  -

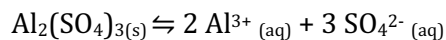
How do we ADD  $\text{Ag}^+_{(aq)}$  or  $\text{Cl}^-_{(aq)}$ ?

- ❖ Introducing another salt, which has an ion in common with the first salt, is called the “**Common Ion Effect**”
  - ❖ To add  $\text{Ag}^+$ ...
  - ❖ To add  $\text{Cl}^-$ ...

Which of the following salts could be added to DECREASE the solubility of  $\text{AgCl}$ ?

$\text{AgCl}$        $\text{CaSO}_4$        $\text{KNO}_3$        $\text{ZnS}$        $\text{CaCl}_2$        $\text{AgBr}$        $\text{Mg(OH)}_2$        $\text{NH}_4\text{CO}_3$

1. Consider the following reaction:



If the following compounds were added,

- I.  $\text{Na}_2\text{S}$
- II.  $\text{Al}_2(\text{SO}_4)_3$
- III.  $\text{NaNO}_3$
- IV.  $\text{K}_2\text{SO}_4$

a) Solubility would increase:

- A. I only
- B. I & II
- C. II & IV
- D. III & IV
- E. IV only

b) Solubility would decrease:

- A. I only
- B. I & II
- C. II & IV
- D. III & IV
- E. IV only

2. Consider a solution of NaBr.

a. Write the solubility equilibrium reaction:

b. Each of the following solutions is added to the solution of NaBr. State whether each will increase or decrease the solubility. Order the solutions in order of decreasing solubility.

	1.0 M NaCl	1.0 M AgNO <sub>3</sub>	1.0 M KNO <sub>3</sub>	1.0 M Na <sub>2</sub> SO <sub>4</sub>	2.0 M AgNO <sub>3</sub>
Increase or decrease solubility?					

\_\_\_\_\_

Increase solubility

\_\_\_\_\_

Decrease solubility