

第 7 題

A solution contains the ions Ag^+ , Pb^{2+} , and Ni^{2+} . Dilute solutions of NaCl , Na_2SO_4 , and Na_2S are available to separate the positive ions from each other. In order to effect separation, the solutions should be added in which order?

- (A) Na_2S , NaCl , Na_2SO_4 (B) Na_2SO_4 , NaCl , Na_2S (C) Na_2SO_4 , Na_2S , NaCl (D) NaCl , Na_2S , Na_2SO_4 (E) NaCl , Na_2SO_4 , Na_2S

2.

A solution contains the ions Ag^+ , Ba^{2+} , and Ni^{2+} . Dilute solutions of NaCl , Na_2SO_4 , and Na_2S are available to separate the positive ion from each other. In order to effect separation, the solutions should be added in which order?

- (A) Na_2S , NaCl , Na_2SO_4 (B) Na_2SO_4 , NaCl , Na_2S (C) Na_2SO_4 , Na_2S , NaCl
(D) NaCl , Na_2S , Na_2SO_4 (E) NaCl , Na_2SO_4 , Na_2S

【106 後西】

ANS: (B), (E), (D)

先加 $\text{S}^{2-} \rightarrow \text{Ag}^+$, Ni^{2+} 沈澱 \rightarrow (A) 失敗先加 $\text{SO}_4^{2-} \rightarrow \text{BaSO}_4$ 沈澱(其實 Ag_2SO_4 也會沈澱, 但溶解度較高); 再加 $\text{Cl}^- \rightarrow \text{AgCl}$ 沈澱; 再加 $\text{S}^{2-} \rightarrow \text{NiS}$ 沈澱 \rightarrow (B) 成功先加 $\text{SO}_4^{2-} \rightarrow \text{BaSO}_4$ 沈澱; 再 $\text{S}^{2-} \rightarrow \text{Ag}_2\text{S}$, NiS 沈澱, (C) 失敗先加 $\text{Cl}^- \rightarrow \text{AgCl}$ 沈澱; 再 $\text{S}^{2-} \rightarrow \text{NiS}$ 沈澱, 再 $\text{SO}_4^{2-} \rightarrow \text{BaSO}_4$ 沈澱, (D) 成功先加 $\text{Cl}^- \rightarrow \text{AgCl}$ 沈澱; 再加 $\text{SO}_4^{2-} \rightarrow \text{BaSO}_4$ 沈澱; 再加 $\text{S}^{2-} \rightarrow \text{NiS}$ 沈澱 \rightarrow (E) 成功

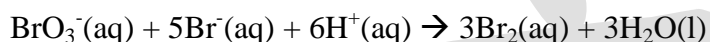
出處: 普化第四部, 溶解度法則

本題其實 Ag_2SO_4 也會沈澱! 但很多 test bank 都認為 Ag_2SO_4 微溶不算沈澱是有爭議的題目, 本題被申訴。

普化第四冊, p175

第 14 題:

The following set of data was obtained by the method of initial rates for the reaction:



Calculated the initial rate when BrO_3^- is 0.30 M, Br^- is 0.050 M, and H^+ is 0.15 M

Expt	$[\text{BrO}_3^-]$ (M)	$[\text{Br}^-]$ (M)	$[\text{H}^+]$ (M)	Rate (M/s)
1	0.10	0.10	0.10	8.0×10^{-4}
2	0.20	0.10	0.10	1.6×10^{-3}
3	0.20	0.15	0.10	2.4×10^{-3}
4	0.10	0.10	0.25	5.0×10^{-3}

(A) 6.1×10^{-5} M/s (B) 2.7×10^{-3} M/s (C) 5.3×10^{-3} M/s (D) 8.4×10^{-2} M/s

ANS: (B)

$$r = k[\text{BrO}_3^-][\text{Br}^-][\text{H}^+]^2$$

$$k = 8 \quad r = 8 \times 0.30 \times 0.050 \times (0.15)^2 = 2.7 \times 10^{-3}$$

【精選範例】



	BrO_3^- mol/L	Br^- mol/L	H^+ mol/L	Rate
1	0.10	0.10	0.10	8.0×10^{-4}
2	0.20	0.10	0.10	1.6×10^{-3}
3	0.20	0.20	0.10	3.2×10^{-3}
4	0.10	0.10	0.20	3.2×10^{-3}

$$\text{Rate} = k[\text{BrO}_3^-]^n[\text{Br}^-]^m[\text{H}^+]^p$$

$$\text{Rate}_2/\text{Rate}_1 = (1.6 \times 10^{-3})/(8.0 \times 10^{-4}) = \frac{k(0.20)^n(0.10)^m(0.10)^p}{k(0.10)^n(0.10)^m(0.10)^p}$$

$$2 = 2^n, n = 1$$

$$\text{Rate}_4/\text{Rate}_1 = (3.2 \times 10^{-3})/(8.0 \times 10^{-4}) = 4 = \frac{k(0.10)^n(0.10)^m(0.20)^p}{k(0.10)^n(0.10)^m(0.10)^p}$$

$$4.0 = (2.0)^p, p = 2$$

同理 Rate3/Rate2 \rightarrow m = 1

$$\text{Rate} = k[\text{BrO}_3^-][\text{Br}^-][\text{H}^+]^2$$

$$8.00 \times 10^{-4} \text{ mol L}^{-1}\text{s}^{-1} = k(0.10 \text{ mol/L})(0.10 \text{ mol/L})(0.10 \text{ mol/L})^2$$

$$k = 8.00 \text{ L}^3 \text{ mol}^{-3}\text{s}^{-1}$$

普化講義第四冊, p.56

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