Exp 12 Synthesis: Preparation of Alum

**Exp. 12 – video**

(time: 6:08 minutes)

Alum: potassium aluminum sulfate dodecahydrate

\[
\text{KAl(SO}_4\text{)}_2 \cdot \text{12H}_2\text{O}
\]

1.) \[2 \text{Al}_\text{(s)} + 2 \text{KOH}_\text{(aq)} + 6 \text{H}_2\text{O}_\text{(l)} \rightarrow 2 \text{K[Al(OH)}_4\text{]}_\text{(aq)} + 3 \text{H}_2\text{(g)}\]

2.) \[\text{K[Al(OH)}_4\text{]}_\text{(aq)} + 2 \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{KAl(SO}_4\text{)}_2\text{(aq)} + 4 \text{H}_2\text{O}_\text{(l)}\]

\(\text{KAl(SO}_4\text{)}_2\text{(aq)}\) cooled \(\rightarrow\) \(\text{KAl(SO}_4\text{)}_2 \cdot \text{12H}_2\text{O}_\text{(s)}\)

Goal of experiment:

\[
\% \text{ yield Alum} = \frac{\text{actual yield (exp), g}}{\text{theo yield (calc), g}} \times 100\%
\]
Theo yield:

\[
(g, Al) \left( \frac{1 \text{ mol Al}}{26.98 \text{ g Al}} \right) \left( \frac{1 \text{ mol KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O}}{1 \text{ mol Al}} \right) \left( \frac{474.44 \text{ g KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O}}{1 \text{ mol KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O}} \right) = \text{theo g KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O}
\]
Cautions:
1.) heat gently – if heat too fast, it will overflow
2.) heat until all Al dissolves (transparent paint flakes without shining back)
3.) first filtering is with regular funnel with small amount of glass wool to catch paint flakes; filter into 250 mL beaker
4.) after ice bath, filtering is done with suction funnel to aspirate filtrate from solid.
   a.) obtain mass of funnel and wet filter paper
   b.) clamp flask to ring stand, connect tube to flask and aspirator, insert funnel, turn on water
   c.) filter sample
   d.) wash sample with portions of 1:1 ethanol-water; do not use pure deionize water.
   e.) disconnect the tube to the aspirator and turn off water
   f.) obtain mass of funnel, wet filter paper, and wet solid. Difference gives mass of wet solid.
5.) experiment is done in groups of 4