Chapter 27 Example Problem

1. (Harris 27-20) A 1.475-g sample containing NH₄Cl (FM 53.492), K₂CO₃ (FM 138.21), and inert ingredients was dissolved to give 0.100 L of solution. A 25.0-mL aliquot was acidified and treated with excess sodium tetraphenylborate, Na⁺B(C₆H₅)₄⁻, to precipitate K⁺ and NH₄⁺ ions completely:

\[
\text{(C}_6\text{H}_5\text{)}_4\text{B}^- + \text{K}^+ \rightarrow (\text{C}_6\text{H}_5\text{)}_4\text{BK(s)}
\]

FM 358.33

\[
\text{(C}_6\text{H}_5\text{)}_4\text{B}^- + \text{NH}_4^+ \rightarrow (\text{C}_6\text{H}_5\text{)}_4\text{BNH}_4\text{(s)}
\]

FM 337.27

The resulting precipitate amounted to 0.617 g. A fresh 50.0-mL aliquot of the original solution was made alkaline and heated to drive off all the NH₃:

\[
\text{NH}_4^+ + \text{OH}^- \rightarrow \text{NH}_3\text{(g) + H}_2\text{O}
\]

It was then acidified and treated with sodium tetraphenylborate to give 0.554 g of precipitate. Find the weight percent of NH₄Cl and K₂CO₃ in the original solid.