

Answer on Question #42265 - Chemistry - Physical Chemistry

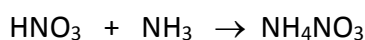
Question:

Calculate the mass of nitric acid needed to make 400 tonnes of NH_3 ?

We suppose that this question was about the ammonium nitrate NH_4NO_3 , because the ammonia cannot be synthesized easily from nitric acid HNO_3 . The ammonium nitrate NH_4NO_3 can be synthesized from HNO_3 and NH_3 .

Solution:

Chemical reaction:



First of all, we will find number of moles of NH_4NO_3 which synthesised in chemical reaction.

$$\vartheta = \frac{m}{M}$$

where ϑ – is number of moles of NH_4NO_3 , m – is mass of NH_4NO_3 , M – is molecular mass of NH_4NO_3 .

$$M(\text{NH}_4\text{NO}_3) = 2 \times 14.007 + 4 \times 1.008 + 3 \times 15.9949 = 80.0307 \approx 80 \text{ g/mol}$$

$$\vartheta = \frac{400000000 \text{ g}}{80 \text{ g/mole}} = 5000000 \text{ mol}$$

According to the reaction equation, th 1 mole of HNO_3 yields 1 mole of NH_4NO_3 .

$$M(\text{HNO}_3) = 1.008 + 14.007 + 3 \times 15.9949 = 62.9997 \approx 63 \text{ g/mole}$$

Now we can calculate mass of HNO_3 needed to make 400 tonnes of ammonium nitrate.

$$m = \vartheta \times M = 5000000 \times 63 = 315000000 \text{ g} = 315 \text{ tonnes}$$

Answer:

315 tonnes of nitric acid needed to make 400 tonnes of **ammonium nitrate** (NH_4NO_3).