A miture of powerded aluminum and tin was burned in the atmosphere of oxygen in a way such that the resulting oxides could be collected and weighed 0.5488g; the mixture of Al2O3 and SnO2 weighed 0.7712g. Calculate the weight percent and atom percent of Al and Sn in the initial mixture .

Solution:

1.$4Al+3O_2=2Al_2O_3$

$Sn+O_2=SnO_2$

2.Let m(Al)=x gram,so,m(Sn)=(0.5488-x)gram, according to the condition of the task.

3.M(Al)=27 gram/mole;

M(Sn)=119 gram/mole;

$M(Al_2O_3)$=102 gram/mole;

$M(SnO_2)$=151 gram/mole.

4. I make a proportion, where a, b are mass Al2O3 and SnO2:

$$\frac{x\ gram}{4\times 54\frac{gram}{mole}}=\frac{a}{2\times 102\frac{gram}{mole}};$$

$$\frac{(0.5488-x)gram}{1\times 119\frac{gram}{mole}}=\frac{b}{1\times 151\frac{gram}{mole}};$$

$$a=\frac{x\times 2\times 102}{4\times 27}=1.889x;$$

$$b=\frac{(0.5488-x)\times 151}{119}=0.7-1.27x;$$

$m(Al_2O_3)+m(SnO_2)$=a+b=0.7712 gram;

1.889x+0.7-1.27x=0.7712

x=0.115

x=m(Al)=0.115 gram

m(Sn)=0.5488-0.115=0.4338 gram

5.ω(Al)=$\frac{0.115}{0.5488}\times 100\%=20.95\%$

ω_1(Sn)=$\frac{0.4338}{0.5488}\times 100\%=79.05\%$

6.n(Al)=$\frac{0.115}{27}=0.0043\ mol$

n(Sn)=$\frac{0.4338}{119} = 0.00365\ mol$

7.N(Al)=0.0043×6.02×10^{23}=0.0259×10^{23}

N(Sn)=0.00365×6.02×10^{23}=0.022×10^{23}

$$\sum\big(N(Al) + N(Sn)\big) = 0.0259 \times 10^{23} + 0.022 \times 10^{23} = 0.0479 \times 10^{23};$$

8.ω_2(Al)=$\frac{0.0259\times10^{23}}{0.0479\times10^{23}}$×100%=54%

ω_3(Sn)=$\frac{0.022\times10^{23}}{0.0479\times10^{23}} \times 100\% = 46\%$

Answer: ω(Al)=20.95%; ω_1(Sn)=79.05%; ω_2(Al)=54%; ω_3(Sn)=46%.