Answer on Question #48269 – Chemistry – Inorganic Chemistry

Data:

m (Zn and Fe) = 3.1 g m (Fe_2O_3 and ZnO) = 4.274 g	Chemical reactions of the conversion of the metals into their oxides are:
W (Zn) = ? W (Fe) = ?	

$$\underset{4\cdot 56\ g/mol}{\overset{(x)\ g}{\mathbf{4\ Fe}}} + \mathbf{3O_2} = \underset{2\cdot 160\ g/mol}{\overset{(y)\ g}{\mathbf{2\ Fe_2O_3}}}$$

$$\underset{2\cdot 65\ g/mol}{\overset{(3.1-x)\ g}{\mathbf{2\ Zn}}} + \mathbf{O_2} = \underset{2\cdot 81\ g/mol}{\overset{(4{,}274-y)\ g}{\mathbf{2\ ZnO}}}$$

Lets express the mass of Fe as *(x) g* and the mass of Zn as *(3,1 – x) g*. The same situation with the mass of oxides. According to the equations calculate the mass of Fe and Zn using algebraic proportions:

$$\begin{cases} \frac{x}{4\cdot 56} = \frac{y}{2\cdot 160}; \\ \frac{3{,}1-x}{2\cdot 65} = \frac{4{,}274-y}{2\cdot 81}; \end{cases}$$

$$\begin{cases} 320\,x = 224\,y; \\ 502{,}2 - 162\,x = 555{,}62 - 130\,y; \end{cases}$$

$$\begin{cases} x = \frac{224\,y}{320}; \\ -53{,}42 - 162\frac{224y}{320} + 130y = 0; \end{cases}$$

$$\begin{cases} x = \frac{224y}{320} \\ -\frac{36288y}{320} + 130y = 53{,}42; \end{cases}$$

$$\begin{cases} x = \frac{224\,y}{320}; \\ -113{,}4\,y + 130\,y = 53{,}42; \end{cases}$$

$$\begin{cases} x = \frac{224\,y}{320}; \\ 16{,}6\,y = 53{,}42; \end{cases}$$

$$\begin{cases} x = 2{,}247; \\ y = 3{,}21. \end{cases}$$

Taking into account calculations the mass of Fe in mixture is 2,247 g, so the mass of Zn is equivalent 0,853 g. The mass percent of both metals is calculated according to formula:

$$W\,(Me) = \frac{m\,(Me)}{m\,(Mixture)} * 100\%$$

$$W\,(Fe) = \frac{2{,}2347\ g}{3{,}1\ g} \cdot 100\% = 72{,}48\ \%;$$

$$W\,(Zn) = \frac{0{,}853\ g}{3{,}1\ g} \cdot 100\% = 27{,}52\ \%.$$

Answer: mass percent for each metal in the original mixture is **72,48% (Fe)** and **27,52% (Zn).**