

Answer on Question #56506 - Chemistry - Other

Question:

Sam and Bob are conducting an investigation to determine the empirical formula of iron oxide. They start with an 85.65g piece of iron metal and burn it in air. The mass of the iron oxide produced is 118.37g. Sam thinks the empirical formula of iron oxide is Fe₃O₄ and Bob thinks it is FeO. Use what you know about how to determine the empirical formula of a compound.

Solution:

Let's calculate the number of the moles of Fe in the piece of iron:

$$n(\text{Fe}) = \frac{m}{M} = \frac{85.65}{55.845} = 1.534 \text{ mol}$$

The mass of Oxygen and the number of the moles of Oxygen are:

$$m(\text{O}) = 118.37 - 85.65 = 32.72 \text{ g}, n(\text{O}) = \frac{m}{M} = \frac{32.72}{16} = 2.05 \text{ mol}$$

Then, the ratio of the number of the moles of Iron and Oxygen are:

$$\frac{n(\text{Fe})}{n(\text{O})} = \frac{1.534}{2} = \frac{3}{4}$$

As the ratio of the number of the moles of Fe and O is 3:4, then the empirical formula is Fe₃O₄.

Answer: Fe₃O₄