Percent composition

The relative amounts of the elements in a compound are expressed as the **percent composition** or **the percent by the mass** of each element in the compound.

The Percent by mass of an element in a compound is the number of grams of the element divided by the mass in grams of the compound multiplied by 100%.

You can use analytical procedures to determine the relative masses of each element in the compound and calculate the percent composition.

* percent composition = $\frac{\text{mass element}}{\text{mass compound}} \times 100\%$

Example

When 13.60 g sample of a compound containing only magnesium and oxygen is decomposed, 5.40 g of oxygen is obtained. What is the percent composition of this compound.

we know

mass of compound = 13.60 g

mass of oxygen = 5.40 g O

mass of magnesium = 13.60-5.40= 8.20 g Mg

$\%\,Mg = \frac{\text{mass Mg}}{\text{mass compound}} \times 100 = \frac{8.20\,g}{13.60\,g} \times 100\% = 60.3\%$

$\%\,O = \frac{\text{mass O}}{\text{mass compound}} \times 100 = \frac{5.40\,g}{13.60\,g} \times 100 = 39.7\%$

$60.3 + 39.7 = 100\%$

try

A compound is formed when 9.03 g Mg combines completely with 3.48 g N. What is the percent composition of this compound?

$\%\text{ comp Mg} = \frac{9.03\,g}{(9.03\,g + 3.48\,g)} \cdot 100\% = 72.2\%$

$\%\text{ comp N} = 100\% - 72.2\% = 27.8\%$

You can also calculate the percent composition if you only know its chemical formula

Using the individual masses of each element and the molar mass you can calculate the percent by mass of each element in one mole of the compound.

* $\%\text{mass} = \frac{\text{mass of element in 1 mol compound}}{\text{mass of compound}} \times 100\%$

Propane C_3H_8 the fuel commonly used in gas grills, is one of the compounds obtained from petroleum. Calculate the percent composition of propane

we know

mass of C in 1 mol of C_3H_8 = 36.03 g

mass of H in 1 mol of C_3H_8 = 8.08 g

molar mass = 44.11 g/mol

$\%\,C = \frac{36.03\,g}{44.11\,g} \times 100\% = 81.7\%$

$\%\,H = \frac{8.08\,g}{44.11\,g} \times 100\% = 18.3\%$

you try

calculate the percent composition of C_2H_6

$M_C = 2 \times 12.01 = 24.02$

$M_H = 6 \times 1.01 = 6.06$

$24.02 + 6.06 = 30.08$

$24.02/30.08 = 0.7985$, $\times 100 = 79.8\%$

$6.06/30.08 = 0.201$, $\times 100 = 20.1\%$

Calculate the percent composition sodium hydrogen sulfate ($NaHSO_4$)