Answer on Question #80826 – Chemistry – Other

Task:

We heat 64.05 g of HgO and obtain 59.33 g of Hg and an O_2 gas. What mass of gas do we get? What mass of HgO is necessary to obtain 35 g Hg?

Solution:

Part 1:

Chemical reaction equation:

$$2HgO = 2Hg + O_2$$

The **law of conservation of mass** or **principle of mass conservation** states that for any system closed to all transfers of matter and energy, the mass of the system must remain constant over time, as system's mass cannot change, so quantity cannot be added nor removed. Hence, the quantity of mass is conserved over time.

Then,

$$m(HgO) = m(Hg) + m(O_2);$$
$$m(O_2) = m(HgO) - m(Hg) = 64.05 - 59.33 = 4.72\ g$$

Or:

by the equation of chemical reaction:

$$n(HgO) = n(Hg) = 2 * n(O_2)$$
$$\mathrm{Mr}(Hg) = 200.59\ g/mol; \quad \mathrm{Mr}(O_2) = 2 * \mathrm{Ar(O)} = 2 * 16 = 32\ g/mol;$$
$$\mathrm{Mr}(HgO) = \mathrm{Ar(Hg)} + \mathrm{Ar(O)} = 200.59 + 16 = 216.59\ g/mol$$
$$n(O_2) = \frac{m(O_2)}{M(O_2)} = \frac{m(HgO)}{2 * M(HgO)} = \frac{m(Hg)}{2 * M(Hg)};$$
$$m(O_2) = \frac{m(HgO) * M(O_2)}{2 * M(HgO)} = \frac{m(Hg) * M(O_2)}{2 * M(Hg)};$$
$$1) \quad m(O_2) = \frac{m(HgO) * M(O_2)}{2 * M(HgO)} = \frac{64.05 * 32}{2 * 216.59} = 4.73\,g;$$
$$2) \quad m(O_2) = \frac{m(Hg) * M(O_2)}{2 * M(Hg)} = \frac{59.33 * 32}{2 * 200.59} = 4.73\,g.$$

Part 2:

$$n(HgO) = n(Hg)$$

$$\mathrm{Mr}(Hg) = 200.59\, g/mol;$$

$$\mathrm{Mr}(HgO) = \mathrm{Ar(Hg)} + \mathrm{Ar(O)} = 200.59 + 16 = 216.59\, g/mol$$

$$\frac{m(HgO)}{M(HgO)} = \frac{m(Hg)}{M(Hg)};$$

$$m(HgO) = \frac{m(Hg) * M(HgO)}{M(Hg)};$$

$$m(HgO) = \frac{35 * 216.59}{200.59} = 37.79\, g$$

Answer: 1) 4.73 g of gas (O_2). 2) 37.79 g of HgO is necessary to obtain 35 g Hg