

## Answer on Question #67878 - Chemistry – General Chemistry

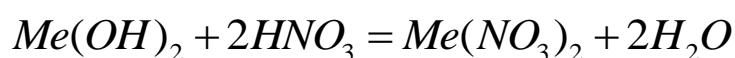
### Task:

A metal hydroxide has the formula  $M(OH)_2$ . An aqueous solution of this hydroxide has a concentration 6.16g per liter  $30\text{cm}^3$  of this solution required  $24\text{cm}^3$  of acid solution containing  $5.67\text{g/dm}^{-3}$  of nitric acid for complete neutralization. Calculate:

- The molarity of the metallic hydroxide
- Relative atomic mass of the metal M

### Solution:

Let's write down the reaction of chemical interaction:



By the reaction equation:  $n(Me(OH)_2) = n(HNO_3)/2$

$$\text{Then, } C(Me(OH)_2) * V(Me(OH)_2) = \frac{C(HNO_3) * V(HNO_3)}{2}$$

Let's find the molar concentration of  $HNO_3$ :

$$C(HNO_3) = \frac{n(HNO_3)}{V(HNO_3)} = \frac{m(HNO_3)}{M(HNO_3) * V(HNO_3)}$$

$$M(HNO_3) = 63.012 \text{ g/mol};$$

$$C(HNO_3) = \frac{5.67 \text{ g}}{63.012 \text{ g/mol} * 1\text{L}} = 0.08998 \text{ mol/L} \approx 0.09 \text{ mol/L}$$

Let's find the molar concentration (molarity) of  $Me(OH)_2$ :

$$C(Me(OH)_2) = \frac{C(HNO_3) * V(HNO_3)}{2 * V(Me(OH)_2)} = \frac{0.09 \text{ mol/L} * 24\text{cm}^3}{2 * 30\text{cm}^3} = 0.036 \text{ mol/L}$$

Let's find atomic mass of the metal Me:

$$C(\text{Me}(\text{OH})_2) = \frac{n(\text{Me}(\text{OH})_2)}{V(\text{Me}(\text{OH})_2)};$$

$$C(\text{Me}(\text{OH})_2) = \frac{m(\text{Me}(\text{OH})_2)}{M(\text{Me}(\text{OH})_2) * V(\text{Me}(\text{OH})_2)}; \Rightarrow M(\text{Me}(\text{OH})_2) = \frac{m(\text{Me}(\text{OH})_2)}{V(\text{Me}(\text{OH})_2) * C(\text{Me}(\text{OH})_2)};$$

$$M(\text{Me}(\text{OH})_2) = \frac{6.16\text{g}}{1\text{L} * 0.036\text{mol/L}} = 171.11\text{g/mol}$$

$$M(\text{Me}(\text{OH})_2) = Ar(\text{Me}) + 2 * Ar(\text{O}) + 2 * Ar(\text{H})$$

$$171.11 = Ar(\text{Me}) + 2 * 16 + 2 * 1;$$

$$171.11 = Ar(\text{Me}) + 34;$$

$$Ar(\text{Me}) = 137.11$$

This metal is barium (Ba). A metal hydroxide = Ba(OH)<sub>2</sub>.

**Answer:** 1) The molarity of the metallic hydroxide is 0.036 mol/L;

2) Atomic mass of the metal M is 137.11. This is barium (Ba).