

Answer on question #80542, Chemistry-general chemistry

Question:

an aqueous solution is 3.75% by mass of nonelectrolyte (MM=178g/mol). if the density of the solution is 1,012g/mL, calculate the molality of the solution, the mole fraction of the solute and the molarity of the solution

$$\rho = 1,012 \text{g/cm}^3$$

$$W = 3,75\% = 0,037$$

$$MM = 178 \text{g/mol}$$

$C_m$  - ?

$\mu$  - ?

$N$  - ?

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Solution:

We suggest  $V$  (solution = 1 L=1000ml. Then,  $m(\text{solution}) = \rho \cdot V = 1,012 \cdot 1000 = 1012 \text{g}$

$$m(\text{solute}) = m(\text{solution}) \cdot w = 1012 \cdot 0,037 = 37,4 \text{g}$$

$$n = m(\text{solute}) / M_m = 37,4 / 178 = 0,21 \text{ mol}$$

$$C_m = n / V = 0,21 / 1 = 0,21 \text{ mol/l}$$

$$\mu = n / 1000 \text{g solvent}$$

$$m(\text{solvent}) = m(\text{solution}) - m(\text{solute}) = 1012 - 37,4 = 974,6 \text{ g}$$

$$\mu = 0,21 \cdot 1000 / 974,6 = 0,215 \text{ mol/g}$$

$$N = n / (n_1 + n_2)$$

$$n(\text{H}_2\text{O}) = m(\text{solvent}) / M(\text{solvent}) = 974,6 / 18 = 54,14 \text{ mol}$$

$$N = 0,21 / (0,21 + 54,14) = 0,0038$$

Answer:  $C_m = 0,21 \text{ mol/l}$ ,  $\mu = 0,215 \text{ mol/g}$ ,  $N = 0,0038$