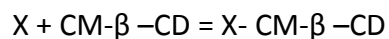


Answer on Question #78316 - Chemistry - Physical Chemistry

Question:

The stability constant of the complex {1-Methyl-2-[5-(methyl-isoxazole-3-yl-amino)-1,2,4-thiadiazole-3-yl]-1-methyl-ethyl)-(2,2,6,6-tetramethyl-4-yl)-amine (X) with Carboxymethyl- β -cyclodextrin (CM- β -CD) is $\beta=292 \text{ M}^{-1}$. Estimate the concentration of free substance X if its initial concentration is 0.01 M and CM- β -CD concentration is 0.4 M

Solution:



$$C_0 \quad 0.01 \quad 0.4 \quad 0$$

$$\Delta C \quad -x \quad -x \quad x$$

$$[C] \quad 0.01-x \quad 0.4-x \quad x$$

$$\beta = [X\text{-CM-}\beta\text{-CD}] / ([X][\text{CM-}\beta\text{-CD}]);$$

$$292 = x / ((0.01-x)(0.4-x));$$

$$292 = x / (0.004 - 0.41x + x^2);$$

$$x = 292x^2 - 119.72x + 1.168;$$

$$292x^2 - 120.72x + 1.168 = 0$$

$$x = 0.00991$$

$$\text{So, } (-x) \text{ of } x = -0.00991 \text{ M};$$

$$\text{So, } [X] = 0.01 - 0.00991 = 0.00009 \text{ M}.$$

Answer: 0.00009 M.

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