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 β=292 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:

	X +	CM-β –CD	=	X- CM-β –CD
C_0	0.01	0.4		0
ΔC	-x	-x		x
[C]	0.01-x	0.4-x		x

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

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

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

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

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

$x = 0.00991$

So, (-x) of x = -0.00991 M;

So, [X] = 0.01-0.00991 = 0.00009 M.

Answer: 0.00009 M.