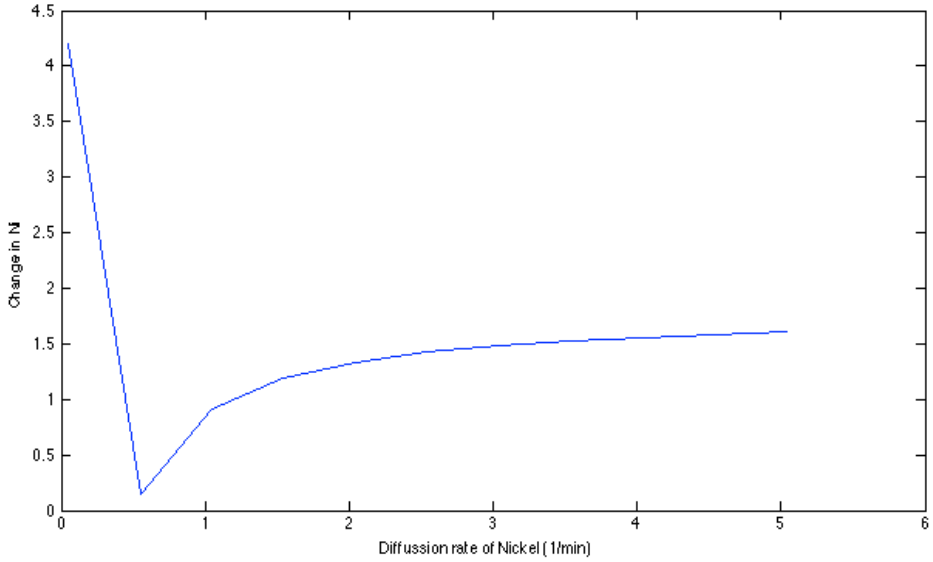
SENSIBILITY ANALYSIS - NICKEL

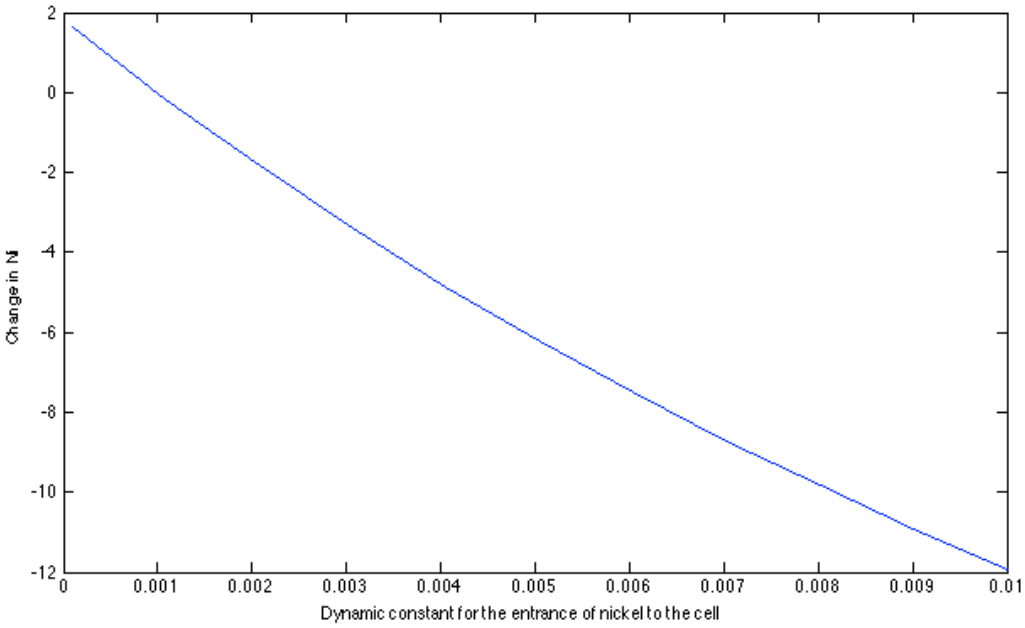
In order to see which of the parameters were the most relevant for the model we performed a sensitivity analysis. We took the values found in the literature and evaluated the model in a range that varied from one order of magnitude below the known value to one order of magnitude greater.

1. γ_n Diffusion rate of Nickel : The graph shows and initial decrescent behavior. As we can see in graph 3, at 0.2 the curve reaches its lower point and begins to grow at a slow rate, it tends to reach stability at 1.5. After the value of the parameter is 2 the response in the system tends to stabilize meaning that the change in the parameter does not affect the system.

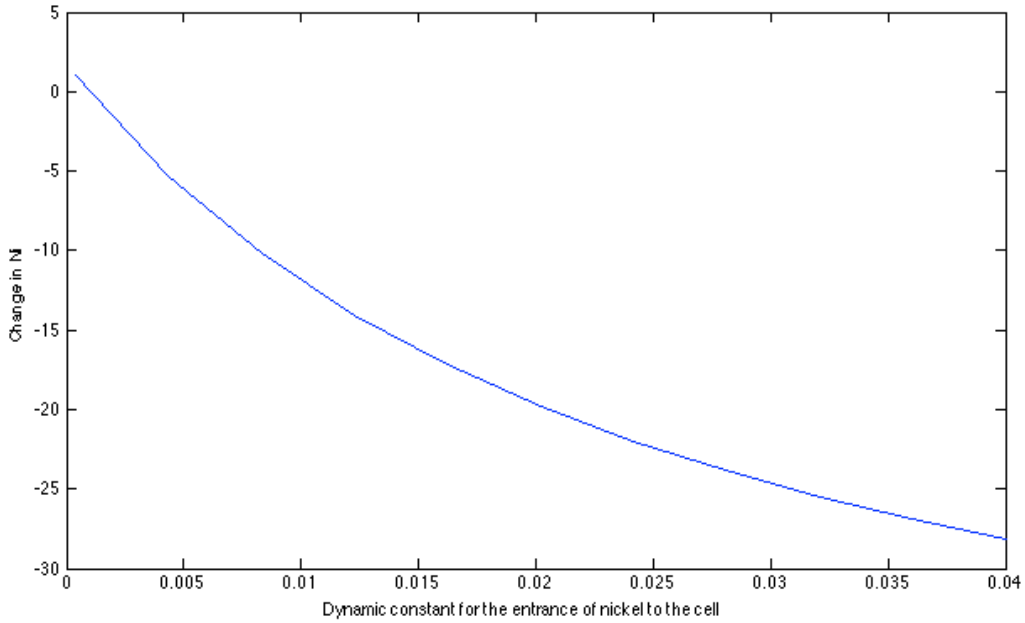


Graph 1 Lower Limit: 0.05034 Upper Limit: 5.034

2. k_p Dynamic constant for the entrance of nickel to the cell: The graphs 2 and 3 show a decrescent behavior, as the dynamic constant for the entrance of nickel to the cell increases, the change in nickel concentration decreases. The curve reaches negative values, which means that the nickel inside is greater than the nickel inside the nickel outside.

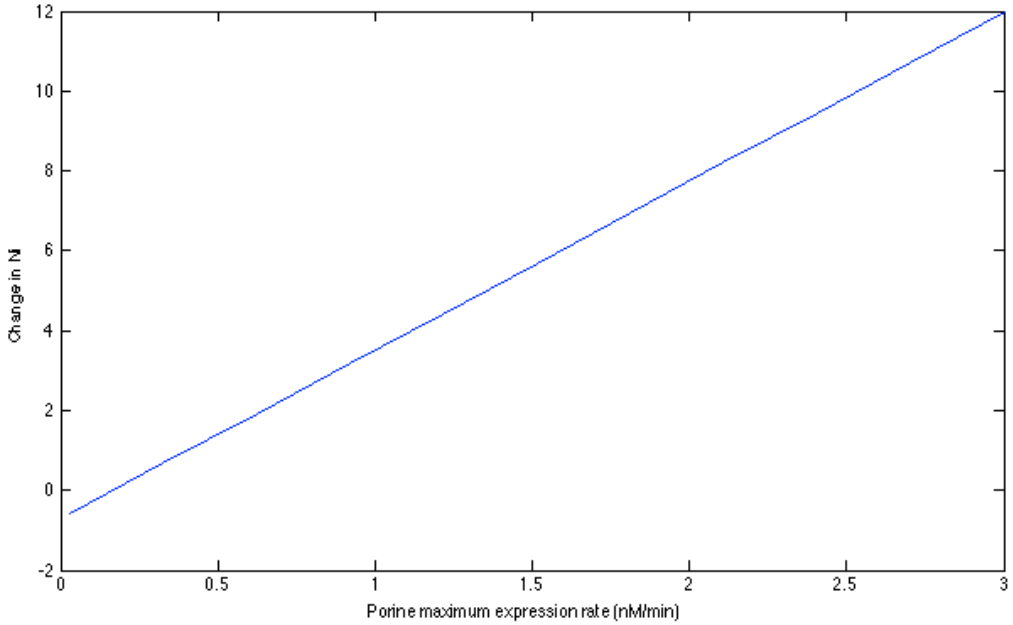


Graph 2 Lower Limit: 1e-4 Upper Limit 1e-2



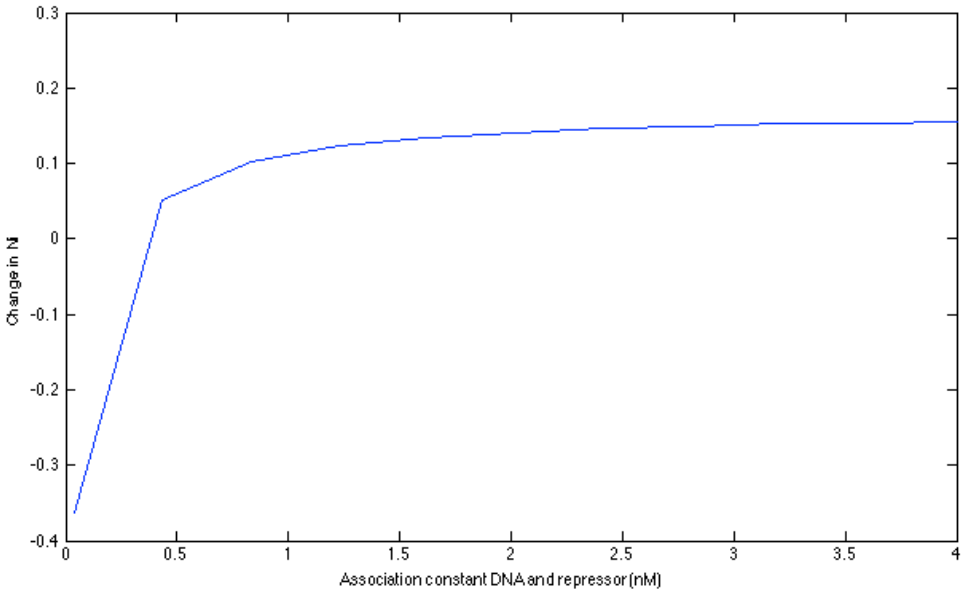
Graph 3 Lower Limit: 4e-4 Upper Limit 4e-2

3. β Porine maximum expression rate: Graph 4 shows a proportional relation between the change in nickel concentration and the Porine maximum expression rate. Both show a straight line that tends to infinite and has a constant crescent behavior.

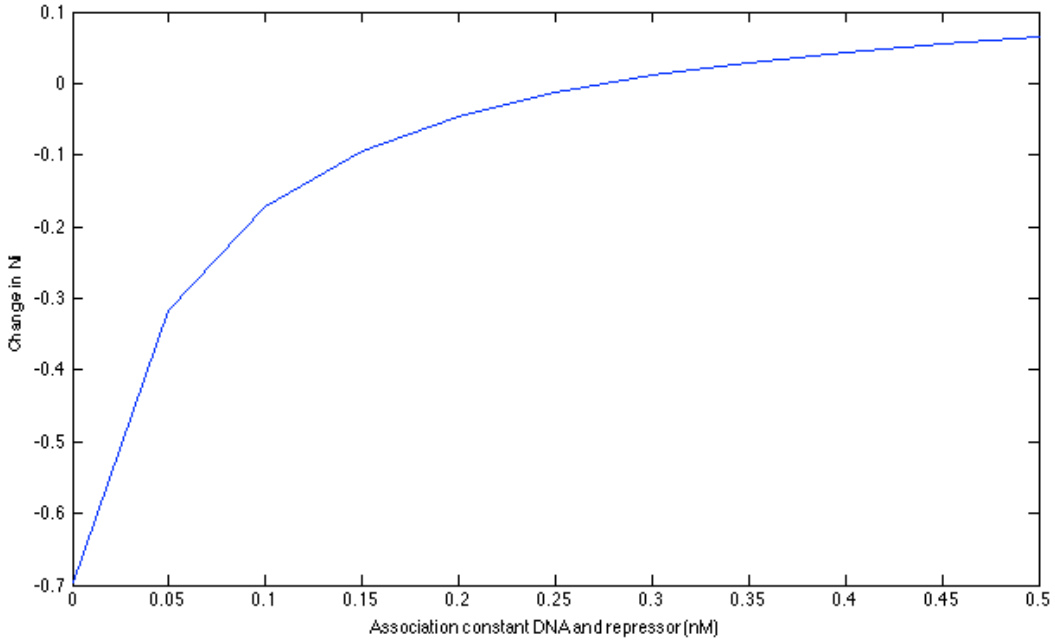


Graph 4 Lower Limit: 0.033 Upper Limit: 3

4. k_d Association constant DNA and repressor: The graphics below show a curve with an accelerated increasing behavior from 0 to 0,5, then it begins to reduce the growth rate and tends to stability. Association constant DNA and repressor and change in nickel concentration are proportionally related. After 1 the association with the DNA and the repressor has not effect on the intake of Nickel.

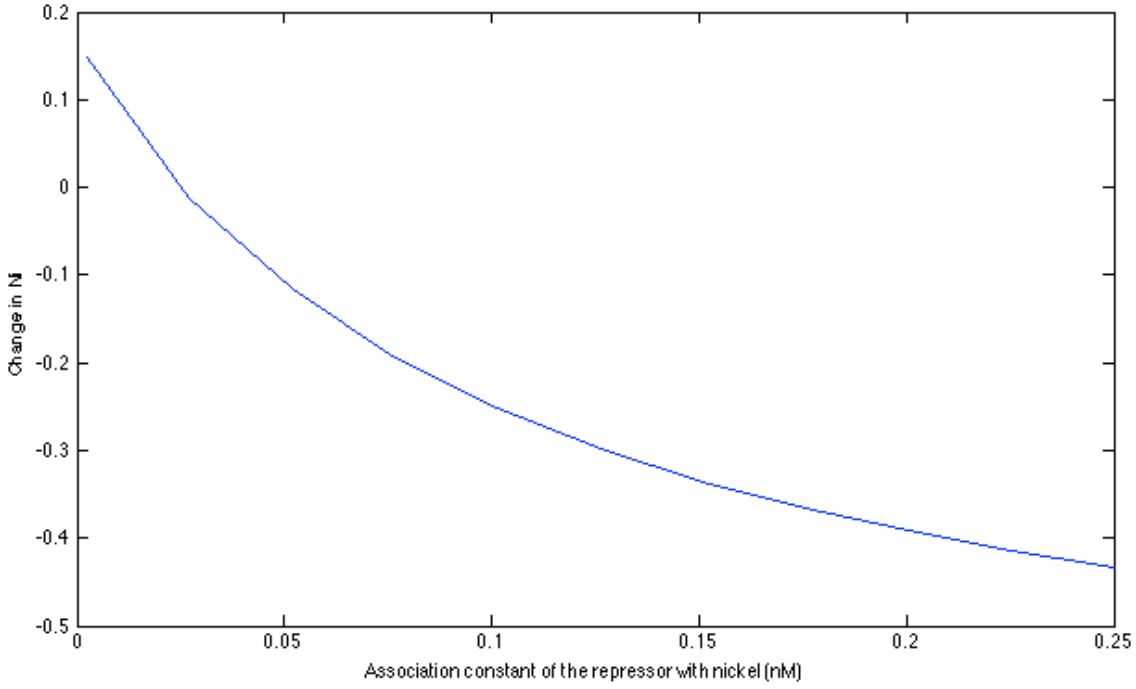


Graph 5 Lower Limit: 400e-4 Upper Limit 400e-2

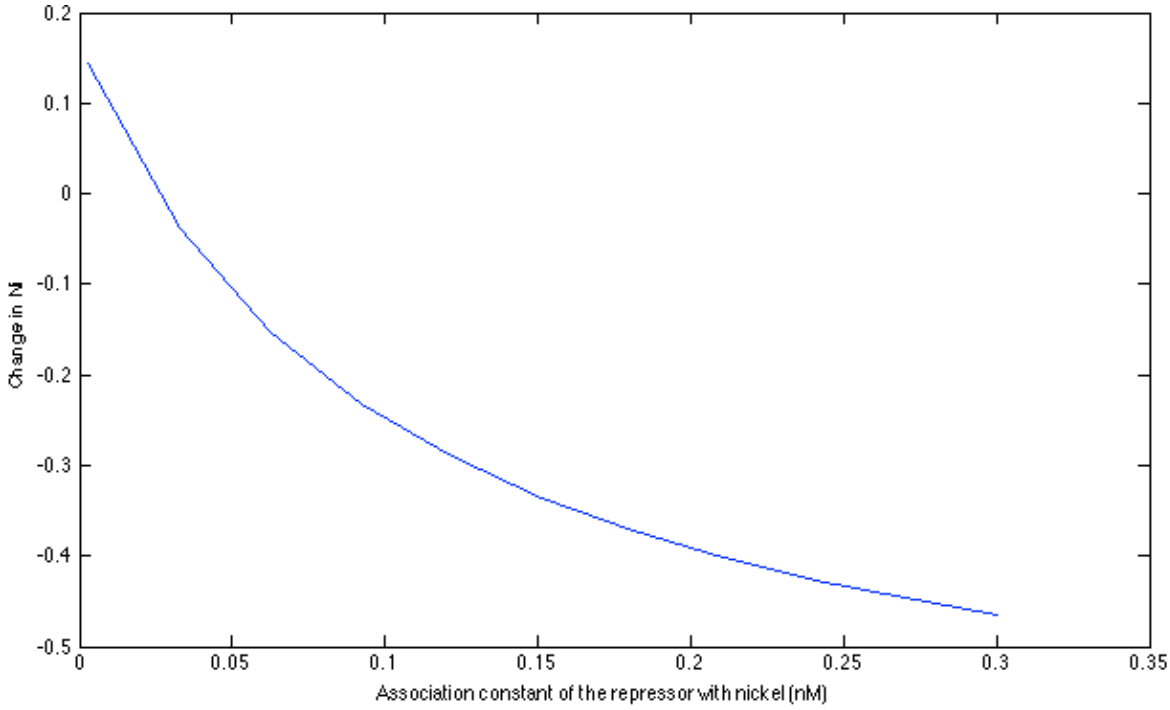


Graph 6 Lower Limit: 0 Upper Limit 0.5

5. k_x ***Association constant of the repressor with nickel:*** Graphs 7 and 8 show an inverse relation between the change in nickel concentration and the association constant of the repressor with nickel.

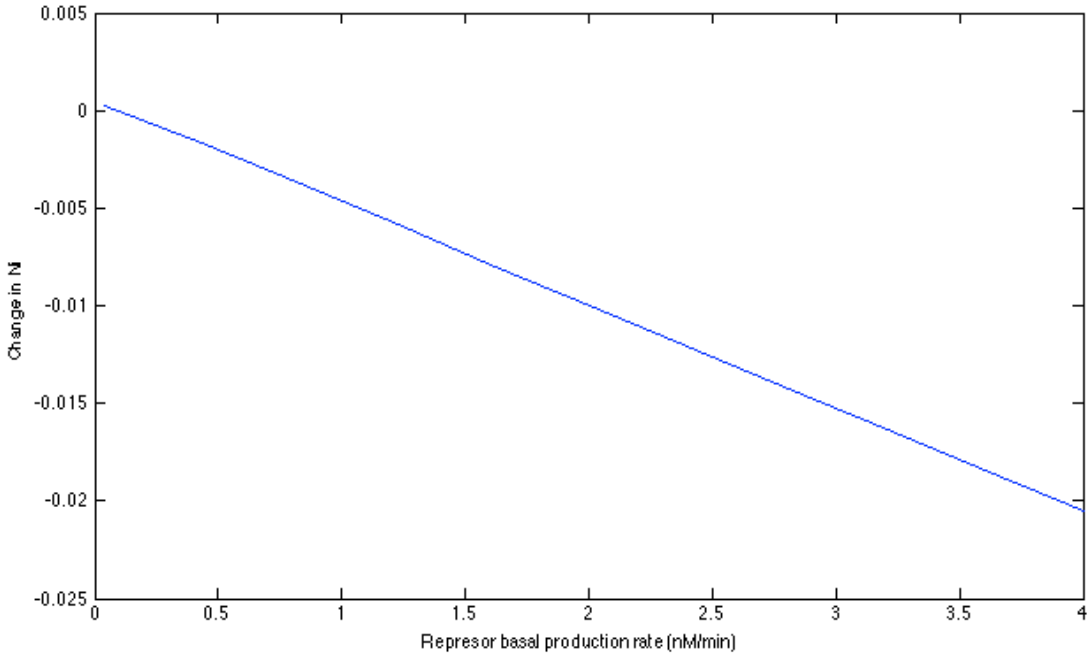


Graph 7 Lower Limit: 25e-4 Upper Limit 25e-2



Graph 8 Lower Limit: 30e-4 Upper Limit 30e-2

6. α_r Repressor basal production rate : Graphs 9 shows an inverse relation between the repressor basal production rate and the change in nickel concentration which reaches values under zero, which makes sense to the system. If more repressor is produced per minute there is more probability that at any time there is always a repressor bounded to the DNA.



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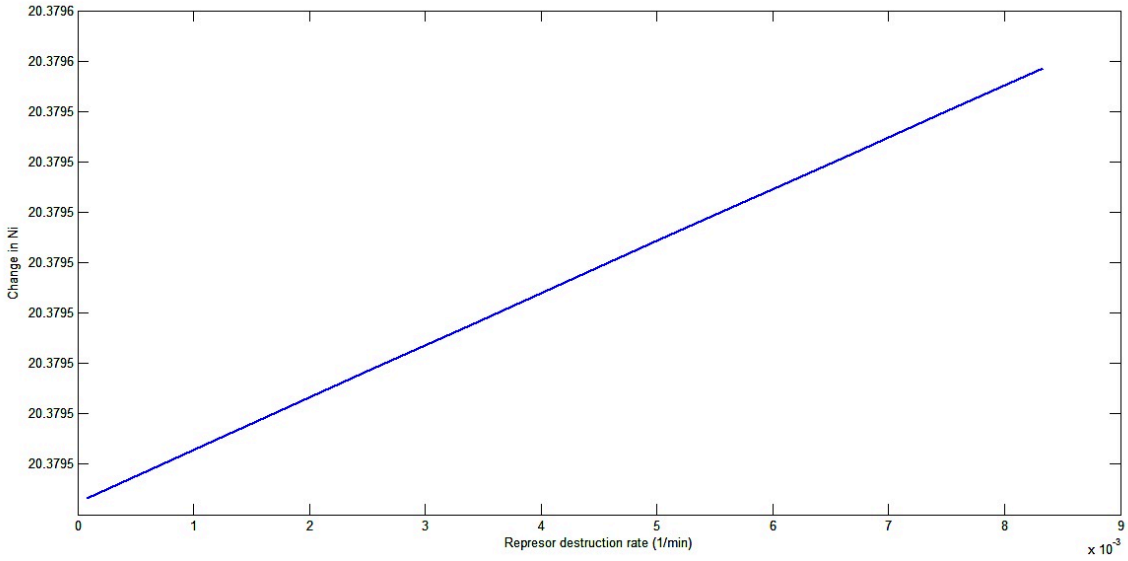
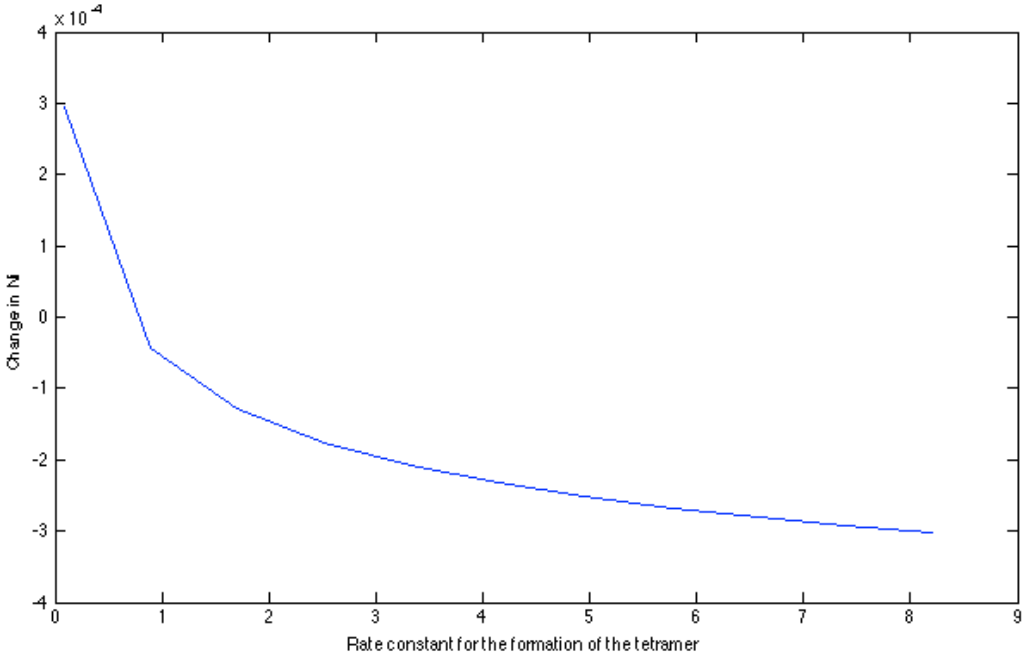
Graph 9 Lower Limit: 0.04 Upper Limit 4

7. ***δ_r Repressor destruction rate:***. The change in nickel concentration and the repressor destruction rate are proportional quantities. It means that if the repressor is dilutes rapidly then the nickel intake will be faster.



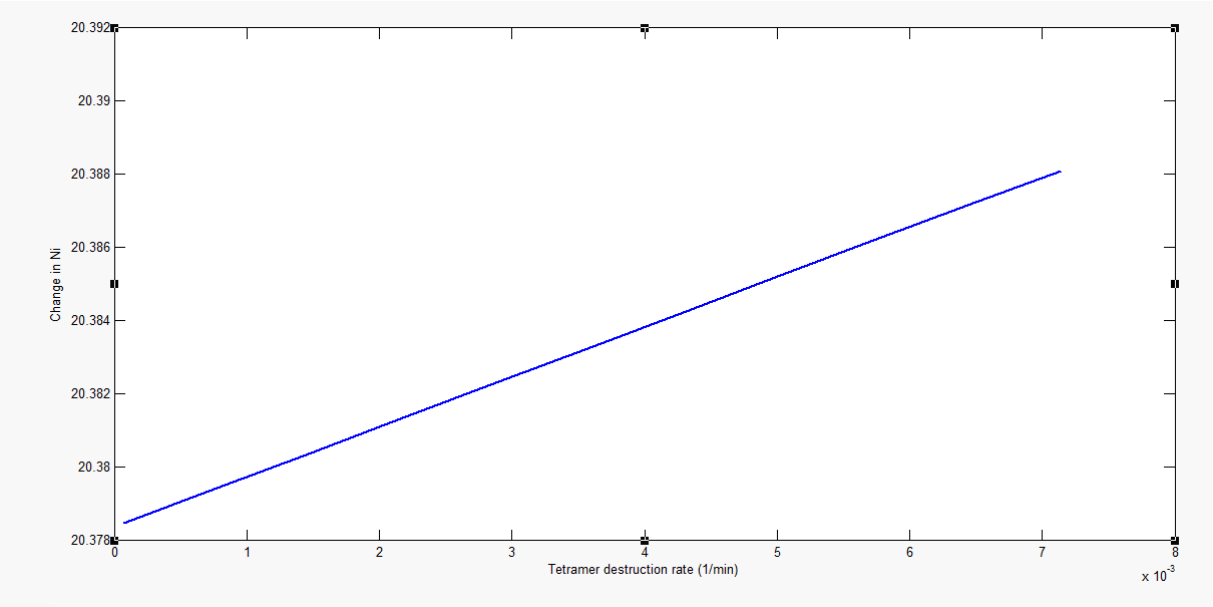
Graph 10 Lower Limit: 1/12000 Upper Limit:1/120

8. ***k_t Rate constant for the formation of the tetramer :*** As soon as the rate constant for the formation of the tetramer starts to grow the change in nickel concentration decreases, which means these two quantities relate inversely, but this change is in the order of 10^{-6} which means that it has no effect on the desire response.



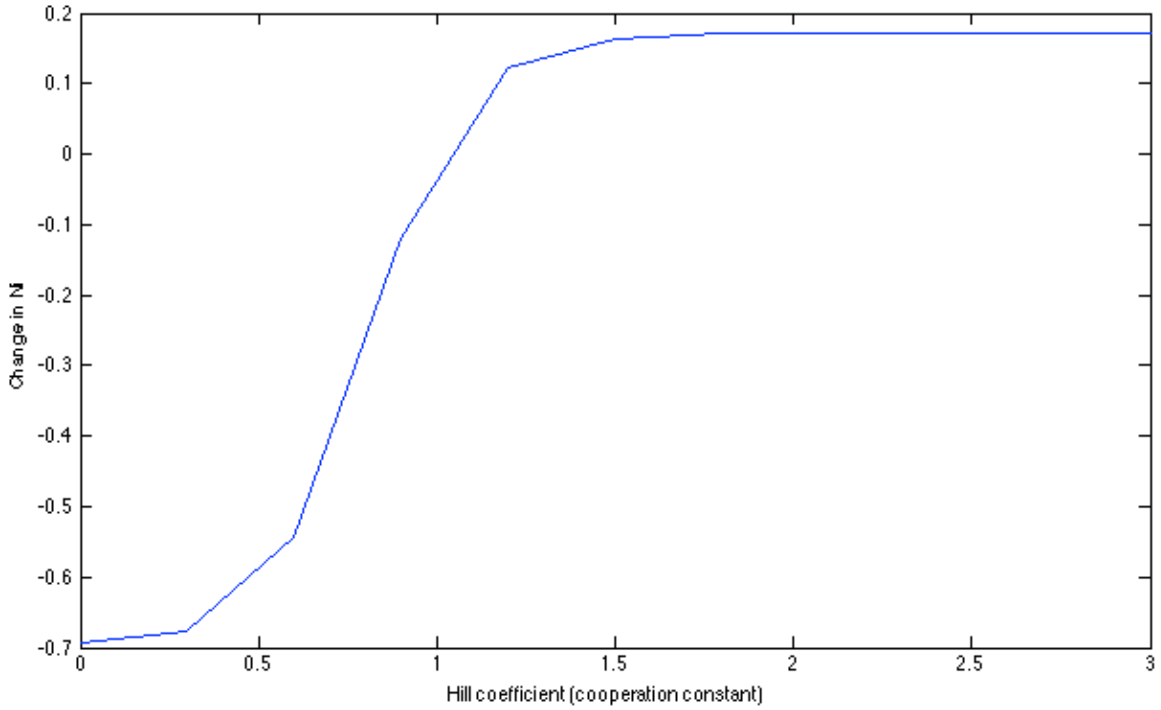
Graph 11 Lower Limit: 0.082 Upper Limit 8.2

9. ***δ_t Tetramer destruction rate:*** This parameter has a proportional effect on the intake of nickel in the cell.



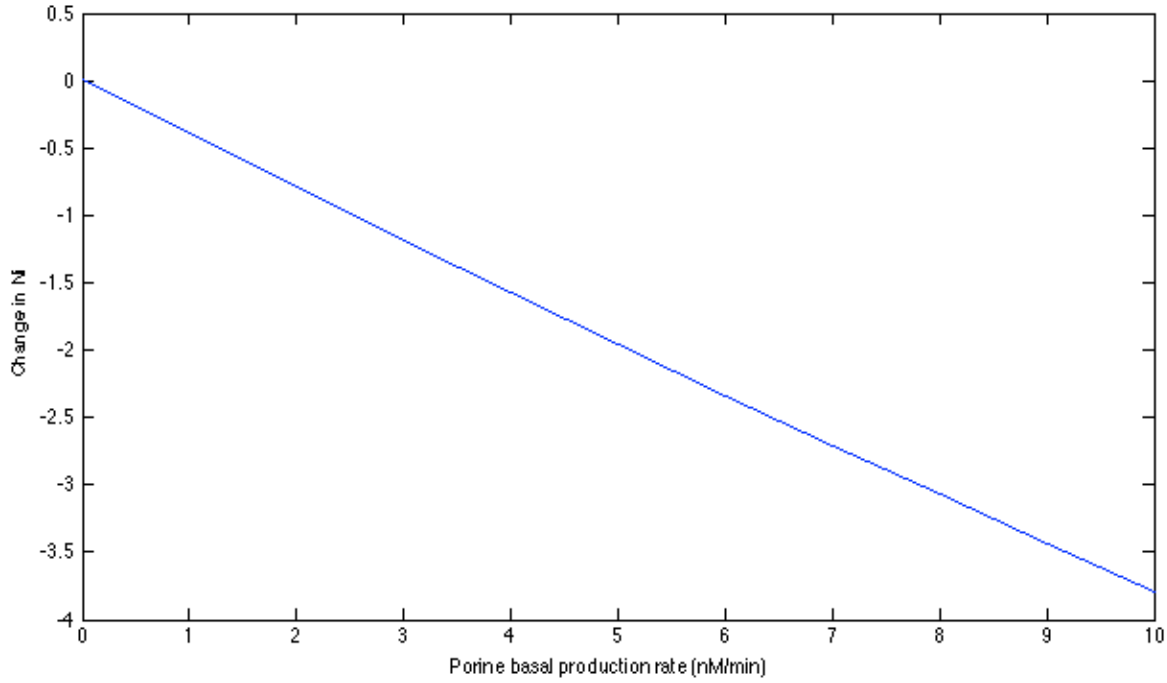
Graph 12 Lower limit: 1/14000, Upper limit: 1/140

10. ***n Hill coefficient:*** As the hill coefficient grows the change in nickel concentration shows an increasing behavior, when hill coefficient gets around 2 the coefficient has no effect on the nickel intake.



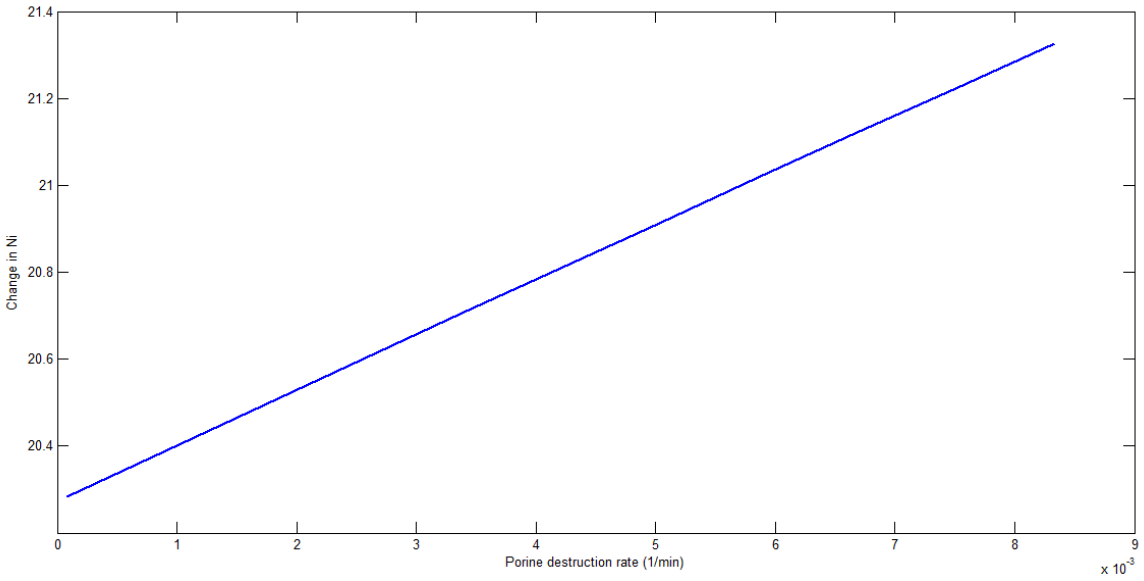
Graph 13 Lower Limit: 0 Upper Limit: 3

11. α_p ***Porine basal production rate:*** The change in nickel concentration and the porine basal production rate are inversely related. As the Porine basal production rate increases the change in nickel concentration decreases and reaches negative values meaning that the nickel inside the cells is greater that outside.



Graph 20 Lower Limit: 0 Upper Limit: 10

12. δ_p ***Porine destruction rate***. The change in nickel concentration and the porine rate destruction are proportional quantities. But the change in the intake of nickel is small.



Graph 22 Lower limit: 1/12000, Upper limit: 1/120