

Rapid Electrochemical Detection of MiRNA-21 Facilitated by the Excellent Catalytic Ability of Pt@CeO₂ Nanospheres

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The definition of the detection limit prescribed by the international union of pure and applied chemistry (IUPAC)¹ is as follows: detection limit, expressed as the concentration, C_L , is derived from the smallest measure and X_L , that can be detected with reasonable certainty for a given analytical procedure. The value of X_L is given by the equation $X_L = X_{b1} + kS_{b1}$, where X_{b1} is the mean of the blank measures, S_{b1} is the standard deviation of the blank measures and k is a numerical factor chosen according to the confidence level desired. It is strongly recommended that the value of k in the equation be 3, and it usually corresponds to a confidence level of about 90% in a practical sense. The values for X_L and S_{b1} cannot usually be determined from theory but must be found experimentally by making a sufficiently large number of measurements. Therefore, the C_L corresponds to the value calculated by the calibration plot obtained from a given analytical procedure where $X_L = X_{b1} + 3S_{b1}$.

In this work, after making three measurements of blank, the $X_{b1}=18.046$ and $S_{b1} = 0.037$ were obtained. Therefore, $X_L = X_{b1} + 3S_{b1}=18.046 + 3 \times 0.037 = 18.157$. The calibration plot of this proposed immunosensor is $I = 8.765\lg C + 152.314$. Therefore, the $C_L = 10^{(I - 152.314)/8.765} = 1.41$ fM, where I is the $X_L = 18.157$. In conclusion, the detection limit of this proposed immunosensor for the detection of miRNA-21 is 1.41 fM.

References

1. N. Iupac, *Spectrochim. Acta (B)*, 1978, **33**, 241-245.