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Title: Optimization of Amperometric Biosensor Design via Mathematical Modelling and Simulation

# Poster Abstract

425 million adults suffered from diabetes globally in 2017 with a predicted increase of 50 % by 2045 [1]. One good way to reduce the impact of this disease is by continuously monitoring the glucose levels of the patient using analytical devices. We are trying to research a specific case of such analytical devices i.e., enzyme immobilized redox polymer layered biosensors for continuous glucose monitoring using mathematical models.

We have applied a transient numerical scheme using the commercial software MATLAB to solve the mathematical model. Mathematical verification of the system has been carried out by comparing our numerical results to steady state analytical solutions. We are trying to understand the transient regimes before the system reaches steady state. A novel validation procedure has been devised using the deflavinated enzyme to change the kinetic parameters in the physical system. The response will be compared with the simulated results.

We also present an optimization of the physical system by using engineering constraints. This work has the potential to better explain the working of analytical devices and improve their working.

# References

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| [1] | D. K. Mukaz, M. K. Melby, M. A. Papas, K. Setiloane, N. A. Nmezi and Y. Commodore-Mensah, “Diabetes and acculturation in African immigrants to the United States: analysis of the 2010–2017 National Health Interview Survey (NHIS),” *Ethnicity & Health,* vol. 27, no. 4, pp. 1355-7858, 2022. |