
Inhibition Studies of ALP on Heavy Metal Ions for the Design of Enzyme Based Biosensor to Heavy Metal Ions

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Environment pollution by toxic heavy metals (HM) presents a real-life threat for human health. Accumulation of heavy metals like Cadmium, Mercury, Cobalt and Copper in water causes toxic actions if the tolerance level is exceeded. Alkaline Phosphatase (ALP) based conductometric biosensor was designed for estimation of heavy metal ions in drinking water. It is based on inhibition of Alkaline Phosphatase enzyme activity exerted by metal ions. Kinetics of ALP were performed and maximum activity was found to be at using 2U/ml concentration of enzyme and hence was chosen for further studies. ALP immobilization was carried out by sol-gel method and sodium alginate method on two different surfaces: glass and stainless steel. Inhibition characteristics of ALP were tested using different concentrations of individual heavy metals ranging from 10mM to 10⁻⁵mM and also using combination of heavy metals of concentration 10⁻⁴mM. The reaction showed uncompetitive inhibition. Amongst the four heavy metals used, the amount of inhibition was found to be more in mercury compared to other metals. The sensor was designed to have the interdigitated transducers connected to the respective immobilized electrode connected on the PCB board. The data logger was aimed to be designed using Lab View 7.1 software to acquire the voltage and use it to compute the results.

Key words: Alkaline Phosphatase, Interdigitated fingers, Sol-Gel, Inhibition, Lab view 7.1