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# Reagentless Detection of Urea Based on ZnO-CuO Composite Thin Film

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**Abstract :** A reagentless biosensor for detection of urea based on ZnO-CuO composite thin film is presented in following work. Biosensors have immense potential for varied applications ranging from environmental to clinical testing, health care, and cell analysis. Immense growth in the field of biosensors is due to the huge requirement in today's world to develop techniques which are both cost effective and accurate for prevention of disease manifestation. The human body comprises of numerous biomolecules which in their optimum levels are essential for functioning. However mismanaged levels of these biomolecules result in major health issues. Urea is one of the key biomolecules of interest. Its estimation is of paramount significance not only for healthcare sector but also from environmental perspectives. If level of urea in human blood/serum is abnormal, i.e., above or below physiological range (15-40mg/dl)), it may lead to diseases like renal failure, hepatic failure, nephritic syndrome, cachexia, urinary tract obstruction, dehydration, shock, burns and gastrointestinal, etc. Various metal nanoparticles, conducting polymer, metal oxide thin films, etc. have been exploited to act as matrix to immobilize urease to fabricate urea biosensor. Amongst them, Zinc Oxide (ZnO), a semiconductor metal oxide with a wide band gap is of immense interest as an efficient matrix in biosensors by virtue of its natural abundance, biocompatibility, good electron communication feature and high isoelectric point (9.5). In spite of being such an attractive candidate, ZnO does not possess a redox couple of its own which necessitates the use of electroactive mediators for electron transfer between the enzyme and the electrode, thereby causing hindrance in realization of integrated and implantable biosensor. In the present work, an effort has been made to fabricate a matrix based on ZnO-CuO composite prepared by pulsed laser deposition (PLD) technique in order to incorporate redox properties in ZnO matrix and to utilize the same for reagentless biosensing applications. The prepared bioelectrode Urs/(ZnO-CuO)/ITO/glass exhibits high sensitivity (70μAmM$^{-1}$cm$^{-2}$) for detection of urea (5-200 mg/dl) with high stability (shelf life ˃ 10 weeks) and good selectivity (interference ˂ 4%). The enhanced sensing response obtained for composite matrix is attributed to the efficient electron exchange between ZnO-CuO matrix and immobilized enzymes, and subsequently fast transfer of generated electrons to the electrode via matrix. The response is encouraging for fabricating reagentless urea biosensor based on ZnO-CuO matrix.

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