CHAPTER 6

CONCLUSIONS AND SCOPES FOR FUTURE WORK

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6.1. Conclusions

The direct measurement of cholesterol concentration from 0.5 to 22.2 mM using CNT based JLFET has been presented for the first time. The cholesterol ENFET has been fabricated on the ITO coated glass using ECD technique. The enzyme, ChOx has been immobilized by physical adsorption technique on the sensing membrane made of PANI and ZnO nanocomposite. Electrochemical response of this ENFET has been recorded by DMM. Studies on the results have shown good biocatalytic activity at normal temperature and pH. The fabricated ENFET has shown considerable sensitivity ~60 mV/decade which is in good agreement with Nernstian response. Insignificant interference of cholesterol with other biomolecules, low detection limit, long storage stability and reproducibility has been observed from this cholesterol ENFET.

In another work, measurement of acetylcholine using dual-gated CNT based ENFET has been demonstrated. For this, the ENFET has been fabricated on ITO glass using ECD technique. The enzyme, AChE has been immobilized on the sensing membrane made of chitosan doped NiO nanocomposite using physical adsorption technique. The response of this ENFET has shown high sensitivity ~1.25 mM/decade (beyond Nernstian response) with good linearity for acetylcholine concentration from 0.01 to 0.2 mM. The ENFET has shown long storage stability, negligible interference with other biomolecules and fast response time.

In the last work, a graphene based traditional FET has been proposed for detection of cholesterol concentration from 0.5 to 25 mM. This ENFET has been fabricated using ECD technique on ITO. The results of this graphene based ENFET have been compared with the results obtained from the single gated CNT based JLFET for detection of cholesterol as presented in Chapter 3. The comparison result has shown that the graphene based traditional

ENFET has lower sensitivity of 58 mV/decade than that of CNT based JLFET for detection of cholesterol.

From these works, it can be concluded that a single gated JLCNTFET shows better device performance than that of traditional graphene based FET. Moreover, a dual–gated JLCNTFET shows maximum sensitivity than that of other two works presented in this thesis. Further, the fabrication process of these ENFETs using ECD technique minimises the cost and instrumentation as compared to the IC technology uses in semiconductor industry. Thus, the fabricated nanostructured CNT based enzyme FET can create a new generation of devices for estimation of biomolecules and physiological parameters in medical and health–care diagnostic system.

6.2. Scopes for future work

Although, this thesis has explained the demerits of traditional enzyme FET, and motivated to CNT based ENFET for detection of biomolecule, but still there are some drawbacks for development of such CNTFETs using solution method in market. From the study the following points may be included for future work.

1. Designing a system that can produce mass number of CNTFETs using solution method.
2. Developing a method that could be used for desired doping in solution method.
3. Fabrication of a complete BioFET where, both the channel and sensing layer of the FET would be prepared using CNTs only.
4. Blood may be used as real sample for measurement using these fabricated FETs.