7.1 Concluding remarks

Present chapter summarizes the findings of the thesis and some potential proposals for the extension of research work done.

The aim of the present thesis was to *photochemically synthesize noble metallic nanomaterials* by using *photoactive organic molecules* and to *explore* such synthesized metallic nanomaterials in *electrosensing applications*. This study not only provides a simple *photochemical synthetic route* but also opens a new room for developing *amperometric sensing techniques* with *nanomaterials modified electrode*. The prepared nanomaterials having *potentially high surface areas*, *high electroactivity* and *connected structures* could find use as a new class of *advanced electrode hybrid nanomaterials* for promising applications in *electro-sensing* and fabrication of *nano-devices* in *electron transfer studies*. Present thesis has compiled all of our *published results* in Journal of Materials Chemistry-01/RSC Advances-02/ChemElectroChem-01.

(Chapter–3)

We have successfully presented the outline on a *photochemical* assisted synthesis of *gold nanoparticles* by *photoactive dithizone* without aid of any external stabiliser/conventional reducing agent/seeds which is the simplest, most straight forward, limited post synthesis work up and pragmatic. The sensing platform is highly sensitive and showed linear response toward *thiocyanate* additions with sensitivity and limit of detection *0.016 μA/nM* and (*23.348±0.506) nM* respectively at S/N (signal-to-noise ratio): 3.

(Chapter–4)

This chapter described a systematic study of time dependent growth of *silver nanoparticles*. The key to the success of this synthesis is to photo-irradiation of the silver ions using *dithizone* photoactive molecule, without introducing additional conventional reducing agent and stabilizers. Sensing platform is highly sensitive

and showed linear response toward *cefotaxime* additions with a sensitivity and limit of detection *0.244 μA/μM* and (*15.32±0.45) nM* respectively at S/N (signal-to-noise ratio): 3.

(Chapter–5)

We have successfully presented the outline on a *photochemical* assisted synthesis of *gold nanoparticles* by using *photoactive phenothiazine* molecule, without aid of any external stabiliser/conventional reducing agent which is the simplest, most straight forward, limited post synthesis work up and pragmatic. The sensing platform is highly sensitive and showed linear response toward standard *phosphate* additions with a sensitivity and limit of detection *0.794μA/μM* and (*0.022±0.0016) μM* respectively at S/N (signal-to-noise ratio): 3.

(Chapter–6)

Photochemical assisted synthesis of *silver nanodendrites* using *photoactive phenothiazine* molecule is outlined and its application in the *amperometric* sensing of *nitrite* is demonstrated. It was found that appropriate molar ratio between phenothiazine & silver ions and reaction time play very important roles in dendritic morphology. The sensing platform is highly sensitive and showed linear response towards *nitrite* additions with a sensitivity and limit of detection *2.4 μA/μM* and (*2.3 ±0.05) nM* respectively at S/N (signal-to-noise ratio): 3.

7.2 Implication for future work

To achieve commercial success, it is important to further research on modified screen printed electrode for electro-sensing of these hazardous analytes in real sample, which may have future scope of this thesis. Presented method is simple, sensitive, requires no labelling of the analyte with an enzyme/bio molecules. Under optimized conditions, this method yields excellent response toward the chosen analytes since our approach is simple and of low cost, it can be extendable to set up the amperometric sensor on disposable screen-printed electrode for these selected

analytes. Presented scheme may offer a new cost-effective, rapid and simple solution to the inspection of these analytes in environmental aqueous samples.

Although more work needs to be carried out to further investigate on exact molecular structures of photochemically oxidized dithizone/phenothiazine, which serve as a protecting the nanomaterials surface through the interactions with nitrogen and sulphur hetro atom present in its structures (via chromatography, mass spectrometry, NMR, etc.).