CHAPTER 7

CONCLUSIONS
The concentration levels of platinum group metals (PGM) are very low in natural resources, metallurgical intermediates and environmental samples. Thus in recent years, the development of sensitive and reliable techniques for the preconcentration prior to determination of PGM has attracted great interest. It is envisaged that, the introduction of ion imprints on the lines of molecular imprinting provide vital breakthroughs in the preconcentration and/or separation of PGM. Studies carried out with this objective in mind are described below.

The introductory part of the thesis begins with the importance of platinum group metals (PGM) and a discussion on array of analytical techniques available for their quantization. The need for preconcentration prior to analytical determination is highlighted. Again, a summary of literature reports on such preconcentration procedures has been brought out. A curtain raiser to imprinting and detailed account of application of ion imprinting polymers in different areas has been brought out in this chapter. The chapter ends with a scope of proposed work in the area of ion imprinted polymer solid phase extraction of palladium(II) and platinum(IV).

Chapter 2 described the quantitative enrichment and selective separation of palladium(II) from dilute aqueous solution with palladium(II) IIP particles synthesized by using mixed ligand complex of palladium(II) as templates viz. palladium – dimethyl glyoxime – vinyl pyridine. Also the influence of post $\gamma$-irradiation of polymer particles revealed that even with half the amount of palladium(II) per g of unleached polymer, the quantitative enrichment was possible compared to unirradiated polymer particles.

In Chapter 3, the synthesis of palladium(II) IIPs using the ternary complex of palladium(II) with amino quinoline (AQ), hydroxyl quinoline (HQ) or mercapto quinoline (MQ) as one of the ligand and 4- vinyl pyridine as the other ligand was discussed. The imprinting effect was noticed in all cases but the AQ based IIP particles showed better preconcentration efficiency and higher selectivity coefficient
compared to selected noble and other co-existing elements. The rebinding studies carried out also helped in the evaluation of binding parameters.

Chapter 4 described the three different polymerization methods viz. bulk, precipitation and suspension for the synthesis of palladium(II) ion imprinted polymers and the investigations of the analytical performances of the synthesized IIPs. The studies indicated the imprinting effect in all the three cases and the comparative account on the studies for palladium(II) regarding distribution coefficient, retention / binding capacity and selectivity (for palladium(II) over other selected inorganics) are in the order precipitation ~ bulk > suspension. Also the rebinding studies revealed that the binding capacities of the IIP materials obtained by bulk and precipitation method are almost same and for the beads obtained by suspension method have very low binding capacity compared to the other two IIPs, which is in tune with the analytical performance data of the three sets of polymers.

Chapter 5 described the synthesis of palladium(II) ion imprinted polymer via a new strategy i.e., the use of ion association complexes of palladium(II) as templates. The results obtained indicated that the thiocyanate system is superior to the iodide system based on the analytical studies. The thiocyanate based IIP particles were used for the analysis of street/fan blade dust samples using FIA – AAS and the values obtained are quite comparable to the values obtained from standard ICPMS. Thus, the results obtained indicate the possible use of FIA – AAS for the routine monitoring of palladium(II) in environmental samples.

In Chapter 6 we described the synthesis, characterization and analytical application of platinum(IV) imprinted polymer prepared by using the ternary ion association complex of platinum as templates. As a result of imprinting, the distribution ratio as well as selectivity coefficients for platinum(IV) over the co-existing ions increase. This clearly establishes selective recovery of platinum from other noble and transition elements.