CHAPTER I

INTRODUCTION AND OBJECTIVES

Over the last four decades, great progress has been made in the area of polymer chemistry, which focuses essentially on the chemical attachment of reactive and interactive functional groups to polymer backbones, and subsequent application of the immobilized species in some chemical or biochemical process. The chemically bound functional group may be a reagent, a protecting group, a ligand, a metal complex catalyst or some other catalytic species.

Functionalised polymers can be used to promote a wide breadth of organic transformations and serve as effective purification media. The synthetic reactions that functionalized polymers promote and mediate can be monitored using simple analytical techniques such as thin layer chromatography. Most functionalized polymers may be removed by simple filtration upon completion of a reaction and can be recycled several times after their use without appreciable loss of reactivity. The idea of performing chemical reactions on solid polymers in heterogeneous medium was successfully applied by Merrifield in his pioneering work on peptide synthesis. With the advent of combinatorial chemistry and automated synthesis, there has been renewed interest in polymer supported reactions. Although, most of the work involving polymer supports were concerned with repetitive sequential synthesis such as those of polypeptides, polynucleotides and polysaccharides, numerous other applications spanning a wide spectrum of chemistry have been devised. Further, polymer supported synthesis has also been applied in a variety of organic reactions including the synthesis of natural products, heterocyclics and in medicinal chemistry.

Polymer supported species have been employed as reagents for the immobilization of cells and enzymes and for binding transition metal complexes, asymmetric reactions in the
resolution of recemic mixtures,\textsuperscript{28,29} in metal ion sorption,\textsuperscript{30,31} in water treatment,\textsuperscript{32} in the binding of dyes,\textsuperscript{33} as catalysts\textsuperscript{34,35} and other ecological applications.\textsuperscript{36} For polymers, when used as supports for preparing catalysts or organic reagents, their reactivity and selectivity may be seriously altered by the so called polymer effects,\textsuperscript{25,26} the origin of which may be physical or chemical. Physical effects include viscous diffusion effects, steric effects, site separation effects and local concentration effects, while microenvironmental interactions and coordination unsaturations can be grouped as chemical polymer effects. Therefore, the polymer support cannot be treated as an inert species in the strict sense. The yield of the synthesised product depends on the above factors, solvation of the bound species, the mass transport of reagents and solvents, and the structural characteristics of the polymer support.

The principle of classical organic synthesis coined with that of solid phase organic synthesis with suitable alterations in the experimental conditions are utilized in the present work. By employing the methodology of solid phase organic synthesis, an attempt was made to synthesize a number of polyamine molecules with biological importance in human metabolism. Even though the synthesis of these compounds are already known, the ease and simplicity of synthesis and purification procedures during solid phase synthesis are effectively employed throughout the work.

After a brief introduction emphasizing the objectives of the work presented in the thesis, a detailed analysis of the literature on the concepts and characteristics of the polymer supported solid phase organic reactions is given as chapter II. All the parameters, which influence the yield and purity of the product, ease of work-up and latest trends in solid phase organic synthesis is included in this chapter. With a view to realize the advantages of solid phase organic synthesis, the synthesis of few polyamine molecules by applying known synthetic strategies were carried out, the yield and purity were compared. The synthesis and characterization details are included in chapter III. The
chapter IV is the experimental section that deals with different experimental procedures adopted for the synthesis of naturally occurring polyamines, Cadaverine, Putrescine, Spermine, Spermidine and some other polyamines Norspermidine, Homospermidine, Thermospermine. The results of the present investigation are summerised in Chapter V. References are given towards the end of the thesis.