Preface

Conventional drug delivery systems such as tablets or capsules deliver the drug in abrupt way. Therefore, concentration of the drug in blood plasma drops below the minimum effective concentration, resulting loss of therapeutic activity of the drug. Fluctuation of the drug concentration in the blood may cause unnecessary side effects and treatment become cost effective. To overcome this situation, sustained/controlled drug delivery systems are required which can diminish the undesired fluctuations and enhance the therapeutic efficacy. Controlled drug delivery system delivers the drug at the right place, at the right concentration for the right time of period. Now a day, great attentions have been paid to the polymeric controlled drug delivery systems. Polymeric drug delivery systems are of great interest because of their wide range of hydrophobic and/or hydrophilic components and their polymer-polymer, polymer-drug, polymer-solvent, or polymer-physiological medium interactions. Therefore, special attentions have been given to design polymeric controlled drug delivery systems. Both synthetic and naturally occurring polymer, such as polysaccharides can be explored to design controlled drug delivery systems but naturally occurring biopolymers are preferable because of their inherent nontoxic, biodegradable nature and low cost.

Herein, we have focused on the development of chitosan based drug delivery systems. Chitosan is second most abundant biopolymer in the Earth after cellulose. Chitosan is highly biocompatible and biodegradable in nature. It can be easily functionalize because of presence of amino and hydroxyl groups present on its structure. The thesis presents synthesis of chemically modified chitosan, characterization and its application in controlled drug delivery applications. Thesis has been bind up using the

following outlines: Introduction and literature review, results and discussion, and conclusion. The description of the different chapter has been given below:

Chapter 1: This chapter briefly discussed the necessity of controlled drug delivery systems. Use of different polysaccharides in biomedical field has been pointed out. Various polymeric controlled drug delivery systems with their contribution in drug delivery have been focused. A brief overview of chitosan based drug delivery systems has been given in details.

Chapter 2: This chapter deals with experimental section followed by the synthesis and different characterization techniques.

Chapter 3: This chapter focuses on the chemically modified chitosan based drug delivery systems. Chitosan is chemically modified through the grafting of polyurethane chain on its backbone. Effect of grafting on different physicochemical properties of chitosan has been discussed in details. Cytotoxicity of the grafted materials has been checked. The efficiency of the polyurethane grafted chitosan in drug delivery has been evaluated.

Chapter 4: This chapter describes the formation of injectable hydrogel of polyurethane-chitosan brush copolymers. *In vivo* gelation study has been carried out in animal model. *In vitro* drug release kinetics from the hydrogel has been investigated. The cytotoxicity of the developed hydrogel has been checked.

Chapter 5: This chapter deals with development of the chitosan nanohybrids hydrogel and scaffold using two types of nanofiller for drug delivery applications. Mechanical stability of the hydrogel and scaffold has been evaluated. The *in vitro* drug release behavior of the hydrogel and scaffold has been studied. The suitability of the chitosan nanohybrids as biomaterials has been checked through the cytotoxicity assessment.

Chapter 6: This chapter demonstrates the conclusion of the overall research work and the future scope of the research work.

List of journals and books used to bind up the thesis has been given at the end of the thesis as references.