CHAPTER-6

Summary and Conclusions

6.1 Summary and Conclusions

The thesis entitled "**Synthesis of Uronic Acid Building Blocks and Their Application in Oligosaccharide Synthesis"** described the synthesis of uronic acid building blocks through different routes and their applications in different carbohydrates synthesis. The contents of the thesis have been divided into six chapters including this summary and conclusions.

Chapter 1 gave a general introduction to the structure and functions of uronic acids. Several biologically and medicinally significant polysaccharides and GAGs containing uronic acids and their functions were briefly discussed. The objectives of the thesis work have been incorporated in this chapter.

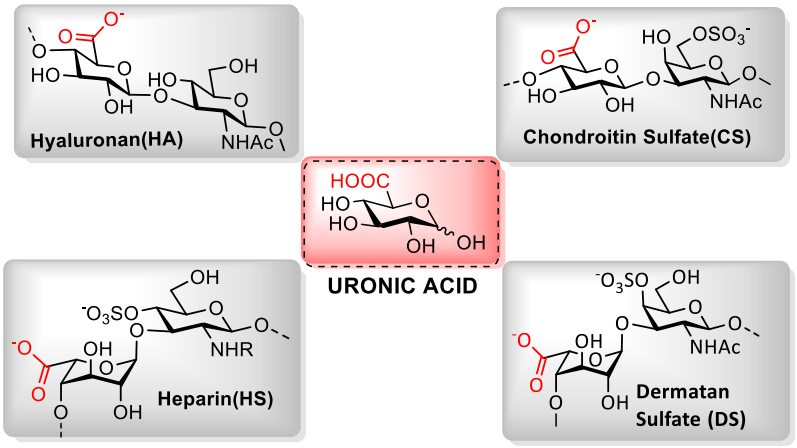
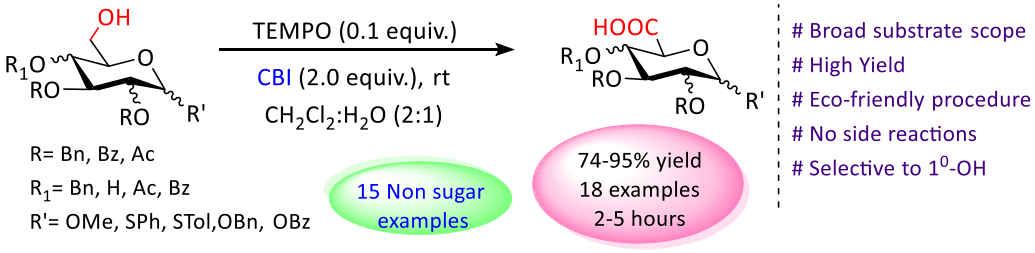


Figure 6.1 Structures of uronic acid containing polysaccharides

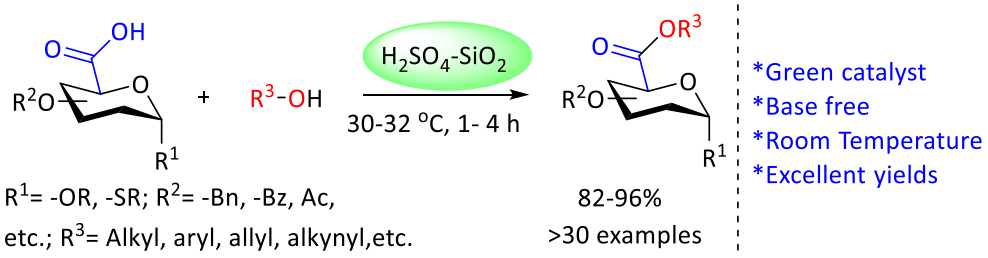
Chapter 2 described a highly efficient TEMPO-catalyzed alcohol oxidation using 1-chloro-1,2-benziodoxol-3(1H)-one as the terminal oxidant (Scheme 6.1). This protocol provides various uronic acids in excellent yields from corresponding alcohols under mild reaction conditions. Moreover, primary alcohols were selectively oxidized over the

secondary alcohols making this protocol potentially useful in the complex oligosaccharide synthesis.



Scheme 6.1 Pictorial presentation of Chapter 2

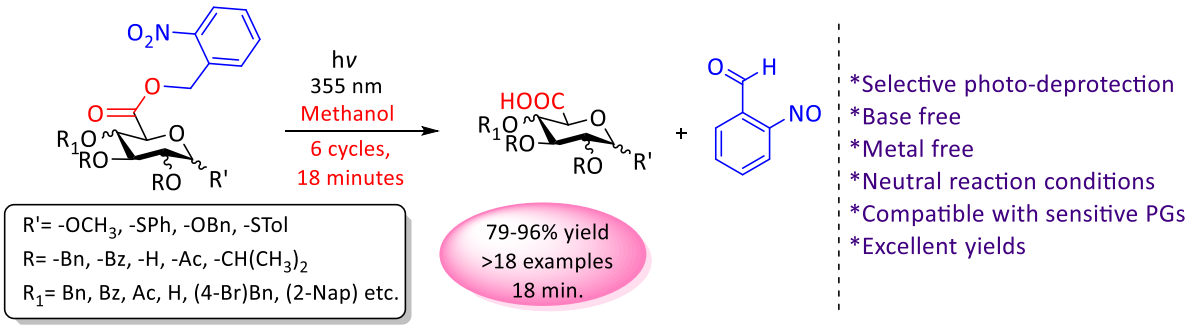
Chapter 3 presented a highly efficient and convenient protocol for the preparation of uronic esters from corresponding uronic acids and alcohols using an eco-friendly solid-supported catalyst, silica-sulphuric acid (H_2SO_4-SiO_2). The reactions proceeded at room temperature and provided various monosaccharide and disaccharide uronic esters of glucose, mannose and galactose bearing different protecting groups and anomeric functional groups. The developed protocol is much more tolerant towards commonly used protecting groups including acetyl, benzoyl, pivaloyl, isopropylidene, benzyl, 2-naphthyl, etc. and gave the products in excellent yields within 4 hours.



Scheme 6.2 Pictorial presentation of Chapter 3

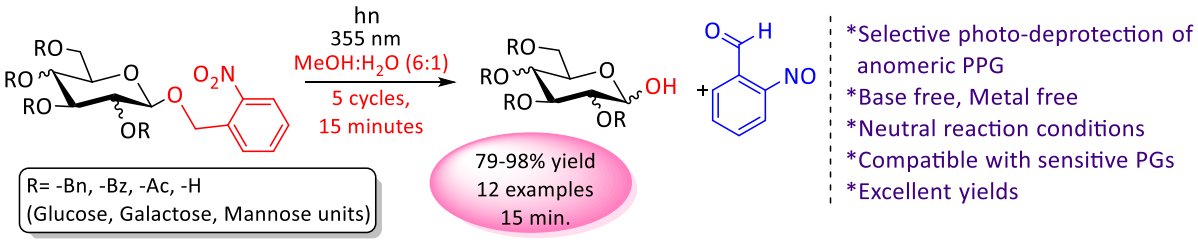
Chapter 4 disclosed the use of photolabile protecting group (2-nitrobenzyl) in uronic acid building blocks. The photolabile protecting group can be selectively cleaved in excellent

yield in the presence of other protecting groups such as acetate, benzoate, acetonide, halobenzyl, 2-naphthyl methyl and carbamate. The deprotection time was drastically reduced from several hours to 18 minutes due to the assistance of a continuous flow photoreactor over traditional batch reactors. This protocol should prove useful for the synthesis of complex oligosaccharides.



Scheme 6.3 Pictorial presentation of Chapter 4

Chapter 5 illustrated the use of photolabile protecting group at the anomeric position in oligosaccharide synthesis. The photolabile protecting group can be selectively cleaved in excellent yield in the presence of other protecting groups under continuous flow photoreactor in a short period. This protocol does not require acidic or basic conditions as well as any chemical reagent; hence it may be helpful for complex oligosaccharides synthesis.



Scheme 6.4 Pictorial presentation of Chapter 5

In conclusion, the synthesis of various orthogonally protected uronic acids had been accomplished using TEMPO and hypervalent (III) iodine reagent under mild reaction conditions at room temperature. The reaction of uronic acids with an excess amount of methanol in presence of green catalyst H_2SO_4-SiO_2 provided synthetically useful uronic methyl esters. Further, introducing a photolabile protecting group in uronic esters proved to be synthetically more worthy as it overcame the epimerization or β-elimination issue at C5 of uronic ester during the global deprotection. PPG was selectively cleaved under UV irradiation of 355nm with the assistance of a continuous flow photoreactor within 18 minutes in neutral conditions. In continuation of the above work, PPG protected anomeric acetals were also prepared and selectively photo deprotected giving corresponding hemiacetals under neutral conditions within 15 minutes. These hemiacetals can easily be converted into glycosylimidates and can be employed into glycosylation reaction.

All the demonstrated protocols in the thesis are superior to most of the existing protocols in terms of reaction condition and yield. Innocuous reagents, convenient procedure, mild reaction conditions and high yields make these methods more attractive in carbohydrate synthesis. Hence, the developed methodologies will find wide applications in synthetic organic chemistry.