## GRAPHICAL ABSTRACT

### Chapter I

**General introduction: An overview on Prins cyclization reaction**

This chapter is devoted specifically to Prins cyclization reaction which emerged as one of the most powerful and versatile tools for the synthesis of highly functionalized tetrahydropyran skeletons. In addition we have discussed the mechanistic studies and scope of the Prins cyclization reaction and also highlight the synthetic achievements of this reaction in total synthesis.

### Chapter II

**An environmentally benign synthesis of octahydro-2H-chromen-4-ol via Prins cyclization reaction using solid acid catalyst**

Monoterpenoid (−)-isopulegol undergoes Prins cyclization reaction with a variety of aldehydes having both electron-donating and electron-withdrawing substituents in the presence of 20 wt% of acid-treated montmorillonite K10 as a catalyst under solvent-free microwave-irradiation to produce octahydro-2H-chromen-4-ols in good yields with high cis selectivities. The solid-acid catalyst can be recycled and reused without losing significant catalytic activity.

### Chapter III

**Synthesis of 4-actamido octahydro-2H-chromens derivatives via Prins-Ritter reaction**
Monoterpenoid (−)-isopulegol undergoes a triflic acid-promoted three-component domino Prins–Ritter reaction with a series of aldehydes to produce a library of novel 4-acetamido-octahydro-2H-chromene derivatives in good yields with high diastereoselectivities.

Chapter IV

Section A: page 120-257
Prins-aryltiolation reaction on terpenoids: diastereoselective synthesis of 4-aryltiooctahydro-2H-chromenes

A library of 4-aryltiooctahydro-2H-chromene derivatives can be synthesized in good to excellent yields with moderate to high cis selectivity by means of Prins-aryltiolation reaction of (−)-isopulegol with different aldehydes and cyclohexanone in the presence of HBF₄·OEt₂ under mild reaction conditions. The use of readily available HBF₄·OEt₂ as a catalyst makes this procedure simple, more convenient and practical.

Section B: page 169-199
Four component domino Prins cyclization reaction for the synthesis of dithiocarbamate derivatives of octahydro-2H-chromenes

HBF₄·OEt₂ catalyzed novel one-pot sequential four-component Prins cyclization reaction has been developed for the synthesis of dithiocarbamate derived octahydro-2H-
chromenes directly from (−)-isopulegol and a variety of carbonyl compounds. This is the first example of a four-component Prins cyclization reaction where different dithiocarbamates generated in situ from carbon disulfide and secondary amines are well participated in this reaction. The Brønsted acid HBF₄.OEt₂ has shown a unique catalytic activity to drive the reaction in the forward direction yielding the products in moderate yields with good diastereoselectivities.

Section C: page 200-257

One-pot three-component Prins cyclization reaction on (−)-isopulegol promoted by HBF₄.OEt₂: diversified synthesis of octahydro-2H-chromenes

HBF₄.OEt₂ can be used to promote the prins cyclization reaction of (−)-isopulegol, aldehydes with external nucleophiles such as trimethylsilylazide, 1-phenyl-5-mercaptotetrazole and acetonitrile to afford their respective cyclized products 4-azidoctahydro-2H-chromenes, 4-[1-phenyl-1H-tetrazolyl]thiooctahydro-2H-chromenes and 4-acetamidoctahydro-2H-chromene in very good yields and moderate diastereoselectivities. Furthermore, without an external nucleophile, HBF₄.OEt₂ can promote this cyclization reaction to afford 4-fluoroocatahydro-2H-chromenes in very good yields with moderate diastereoselectivities. In this case HBF₄.OEt₂ itself acts as a source of nucleophilic.
Synthesis of Mintlactone analogue via Prins cyclization reaction

A very short, novel and efficient synthesis of Mintlactone analogue from (−)-isopulegol has been achieved. The adopted strategy involves the Prins cyclization reaction, oxymercuration, oxidative cleavage with PCC followed by dehydration using POCl$_3$/pyridine.

Diastereoselective synthesis of angularly fused pyranochromenes

Angularly fused pyranochromene derivatives can easily be synthesized by an intramolecular [4+2]-cycloaddition reaction of $o$-quinonemethides generated in situ by the condensation of 6-ethylhept-5-en-2-ol with a variety of salicylaldehydes in the presence of 30 mol% of fluoroboric acid etherate or 30 mol% of triflic acid.