# ABSTRACT

In the Introduction part of this thesis, the chemistry of organo-fluorine compounds including the electronic properties that fluorine impacts onto organic molecules, steric effects, lipophilicity and other characteristics as well as applications and important features of organo-fluorine compounds are briefly discussed. Moreover, summary of the methods for their preparation, modern methods for fluorinations and enantioselective fluorinations, and fluoroalkylation methodologies in organic synthesis are described. Additionally, the chemistry of fluorinated phosphonates including their preparations, important applications and the chemistry of α,α-difluorophosphonates are discussed.

The Results and discussion part describes nucleophilic trifluoromethylation of various electrophilic substrates using diethyl trifluoromethylphosphonate. Furthermore, efficient stereoselective synthesis of fluorovinylphosphonates by a base-induced HF elimination of α,α-difluorophosphonates is explained. In addition, synthesis of number of new, structurally diverse compounds, having a difluorophosphonate moiety using the reaction of diethyl difluoromethylphosphonate with various α,β-unsaturated carbonyl compounds, Michael acceptors and imines are reported. Also, preliminary experiments dealing with nucleophilic reactions of diethyl difluoromethylphosphonate with miscellaneous electrophiles and the generation of difluoromethylphosphoryl radical from the difluoromethylphosphonate carbanion *via* single-electron transfer oxidation using various oxidants is narrated.

In the Experimental section part, detailed experimental procedures including the characterization of synthesized compounds are described.