



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

Name of the Student : RAGHUNATH BAG  
Roll Number : 136122006  
Programme of Study : Ph.D.  
Thesis Title: “**Studies Toward C-O, C-S and C-Se Bonds Formation: Synthesis of Chalcogenated Compounds**”  
Name of Thesis Supervisor(s) : Prof. T. PUNNIYAMURTHY  
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Radical difunctionalization of alkenes has appeared as an important tool for the construction of functionalized organic compounds in pharmaceutical and agrochemical industries. In this regard, the selective and catalytic 1,2-dioxygenation of alkenes is one of the most valuable synthetic strategies for the synthesis of dioxygenated molecules, which are found in natural products as well as used as building blocks in synthetic chemistry. The thesis contains four chapters which covers aerobic radical dioxygenation of alkenes and chalcogenation of arenes through directing group auxiliary assisted C-H activation. The first chapter focuses on copper-catalyzed direct dioxygenation of alkenes with *N*-hydroxyphthalimide to furnish  $\beta$ -keto-*N*-alkoxyphthalimides utilizing molecular oxygen from air as the sole oxidant. Isotope labeling experiment indicates that the source of the ketonic oxygen atom is the atmospheric oxygen from air. The second chapter presents iron-catalyzed hydroperoxydation of alkenes with air employing *N*-hydroxyphthalimide and *N*-hydroxybenzotriazole at room temperature. The third chapter describes a metal-free synthesis of organic nitrate esters from aerobic oxidation of alkenes with *N*-hydroxylamines and *tert*-butyl nitrite. The fourth chapter offers the ruthenium-catalyzed *ortho*-selective C(sp<sup>2</sup>)-H chalcogenation of arenes tethered with 7-azaindole auxiliary using diversely substituted disulfides and diselenides in presence of BINOL as ligand.