Abstract

Ruthenium chemistry is a topic of profound interest. Studies on ruthenium catalyzed organic transformations have received much attention from organometallic chemists. Ruthenium compounds have been used extensively as catalysts for different types of organic reactions due to the ability of ruthenium to attain variety of oxidation states as well as to assume wide range of coordination geometry. For example, ruthenium complexes have been utilized in metathesis, C–H activation, Oppenauer oxidation, and H_2-hydrogenation/transfer hydrogenation.

Ruthenium complex catalyzed organic synthesis has received much attention due to high stereoselectivity of the reactions. For the coupling of various substrates leading to synthetically meaningful carbon–carbon and carbon–oxygen bond formation, which is highly important for the synthesis of various chemicals at bench/industrial scale, ruthenium complexes have been used as catalysts. In view of this, sustained attention is given to improve the rate, efficacy, and substrate scope and product selectivity of these reactions.

The major objective of the present work is to exploit the reactivity of cationic ruthenium complexes as catalysts for formation of carbon–carbon and carbon–oxygen bond leading to olefinic compounds. The thesis entitled **Cationic Ruthenium Complex Catalyzed Carbon–Carbon and Carbon–Oxygen Bond Formation** is primarily an effort towards the exploitation of the catalytic activity of cationic ruthenium complexes and to understand the initial steps in catalytic cycles. The resulted functionalized olefinic compounds have been characterized by ^{1}H NMR, ^{13}C NMR and elemental analysis. The present work on the cationic ruthenium complex catalyzed carbon–oxygen bond formation by the addition reaction of carboxylic acids and sulfonic acids to alkynes was extensively explored. The effect of additives on ruthenium catalytic system has been studied in the thesis. It may be noted that, till date no ruthenium catalyzed addition of sulfonic acid to alkynes has been reported. Further, the cationic ruthenium complex catalyzed carbon–carbon bond formation by the addition reaction of dicarbonyls to alkynes as well as dimerzation of alkynes and coupling of carbonyl compounds to ethyldiazoacetate for synthesizing functionalized olefins were thoroughly studied.

Keywords: Ruthenium catalyst, Carbon–Carbon and Carbon–Oxygen bond formation, Synthesis of olefinic compounds