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DISSERTATION TITLE: *Small-molecule activation at gold: synthesis and reactivity of cyclometalated Au(III) complexes*

Små organiske molekyler er viktige byggesteiner for den kjemiske industrien. I dette arbeidet har funksjonalisering av små, umettede molekyler ved hjelp av støkiometriske og katalytiske mengder organogullforbindelser blitt studert. Blant annet har mekanistiske studier av omdanningen av acetylen til vinyltrifluoracetat ved hjelp av en Au(III)-basert katalysator blitt utført. Innsikten oppnådd i løpet av dette arbeidet vil komme til nytte i den videre utviklingen av Au(III)-katalyse.

Lately, the interest in gold and its rich chemistry has exploded and gold catalysis has become a hot topic. Organometallic complexes of Au(I) have been more studied than Au(III) complexes, but lately, there has been an increased interest in Au(III) complexes as well. Nevertheless, further insight into the reactivity of Au(III) complexes is needed to further develop and improve Au(III) catalysis. Gold is known for its ability to activate unsaturated molecules, such as alkenes and alkynes, towards nucleophilic attack, and addition of nucleophiles to coordinated unsaturated species at gold are key steps in gold catalysis. In this work the reactivity of cyclometalated Au(III) complexes towards small, unsaturated molecules have been studied. Stoichiometric functionalization of alkenes at Au(OCOFCF₃)₂(tpy) (**1**, tpy = 2-(*p*-tolyl)pyridine) leading to β -functionalized Au(III) alkyl complexes have been performed. Following this, metallacycle construction at Au(III) from the cheap and readily available building blocks ethylene, acetonitrile, and water has been achieved. When moving from alkenes to alkynes, catalytic functionalization of acetylene at Au(III) was achieved using complex **1** as a precatalyst. Furthermore, a Au(III) (N,C,C) pincer complex was synthesized via C(sp³)-H activation and this complex was found to outperform complex **1** as catalyst for the acetylene functionalization. Finally, Au(III) η^1 and η^3 allyl complexes were prepared and characterized. η^3 Allyl complexes of Au(III) have not been reported before and is therefore a class of compounds it is important to learn more about. The insight gained through this work is of great importance for further development and understanding of Au(III) catalysis and functionalization of small molecules at Au(III).