Catalytic C-F Bond Activation Using Molecular Hydrogen Promoted by a Rhodium(I) Complex

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A Rhodium(I) complex [(η^5-C_5Me_5)Rh^I(2,2'-bipyridine)] for the catalytic C-F bond activation of fluoroaromatics, using molecular hydrogen as a reductant is presented (**Figure 1**).

Key Words: Molecular hydrogen, C-F activation, Transition metal complexes

Abstract: Molecular Hydrogen (H_2) is of a fundamental importance for future green chemistry. In synthetic chemistry, use of molecular hydrogen as a reductant is attractive from fundamental, economical, and environmental points of view. Catalytic activation and transformation of C-F bonds (the strongest σ-bonds which carbon atom forms) under mild conditions are a challenge in synthetic chemistry. Molecular hydrogen is used in the reaction that converts C-F bonds into C-H bonds, which can provide partially fluorinated molecules as synthetic building blocks for biologically active compounds and functional materials. However, previous systems using molecular hydrogen for C-F bond activation require the conditions of high H_2 pressure and/or high temperature. In this work, it has been found that a rhodium(I) complex [(η^5-C_5Me_5)Rh^I(2,2'-bipyridine)] can catalyzes the C-F bond activation of fluoroaromatics ($C_6F_5CF_3$, C_6F_6, C_6F_5H, $C_6F_5CH_3$) even *under mild conditions* (0.1 MPa of H_2, 25 °C). Furthermore, a plausible catalytic cycle is also proposed, which is supported by the successful isolation of a C-F bond cleavage complex.

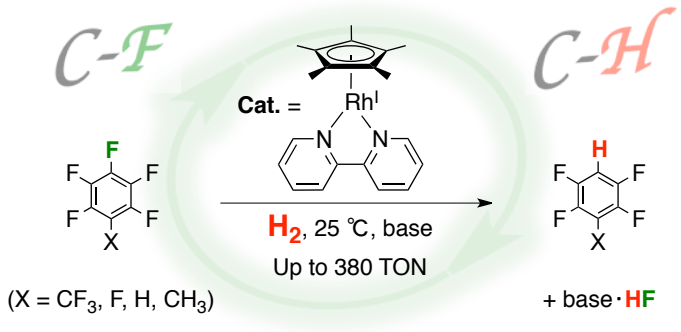

Figure 1. Rhodium(I)-catalyzed C-F bond activation of fluoroaromatics using molecular hydrogen as reductant.