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Department of Chemistry

Dow Lecture Series

9:45 a.m. Tuesday, February 28 • 331 Smith Hall



Associate Professor

Daniel Mindiola

Department of Chemistry
Indiana University

Taming Methane and Other Alkanes with Metal-Carbon Multiple Bonds

Research program entails synthetic and mechanistic organometallic chemistry, and is focused on the design of novel complexes capable of mediating unusual reactions.

Website: <http://info.chem.indiana.edu/sb/page/normal/772.html>

Abstract

Methane is the most abundant but least reactive of the family of alkanes, and current vast supplies constitute nearly 70 percent to 90 percent of the natural gas reserves in the world, a value which now heavily competes with imminent dwindling of petroleum feedstock and the usage of coal. Both natural gas and petroleum account for more than half the amount of energy source being consumed in countries like the U.S. In order to provide energy for many of our day-to-day needs, natural gas is the cleanest of fossil fuels when combusted, but this process inevitably results in the release of the two most abundant greenhouse gases, which are H₂O and CO₂. In this work (and from previous mechanistic studies in our labs) we demonstrate that a transient titanium alkylidyne, (PNP)Ti≡C^tBu (PNP- = N[2-P(CHMe₂)₂-4-methylphenyl]₂), can activate at room temperature, the C-H bond of methane in addition to undergoing exchange (either by a methane adduct or by dehydrogenation via a methylidene). By analogy, other alkanes such as ethane as well as linear alkanes, can be dehydrogenated to their corresponding olefin. Understanding and taking advantage of the dehydrogenation process, we have assembled a similar system using scandium which can catalytically activate and functionalize C-H bonds.

Host: Professor Connie Lu

Refreshments will be served prior to the seminar.