

Inorganic Seminar

Tuesday, August 13, 4:00 pm

Hutchison Hall 473, University of Rochester, Chemistry Department

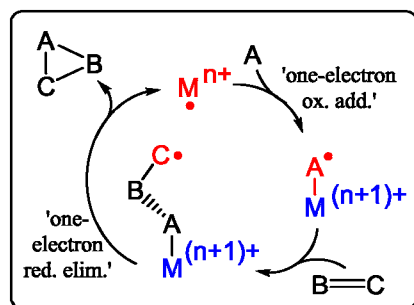
Prof. dr. Bas de Bruin

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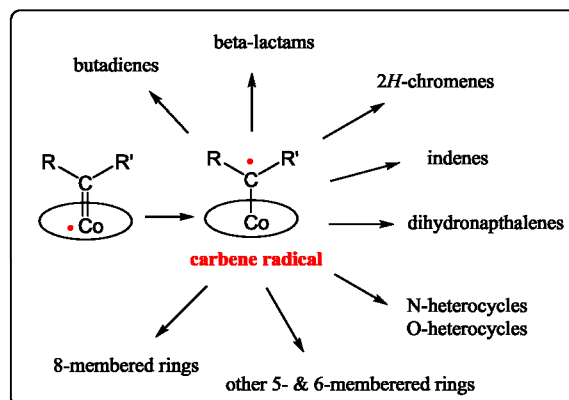


“Catalysis in Single Electron Steps”

Abstract: Organometallic catalysis is the cornerstone of sustainable fine-chemical transformations, but we are currently exploiting only a small part of its full potential. Our understanding and application of organometallic catalysis is predominantly based on closed-shell two-electron reactivity, and consequently traditional synthetic catalysis is primarily based on diamagnetic organometallic complexes undergoing a limited number of elementary steps. A whole new area of open-shell catalysis largely still needs to be explored, which offers fascinating possibilities to steer and control radical-type single-electron transformations. Understanding such reactions aids in the development of entirely new synthetic protocols using sustainable base metal catalysts instead of noble metals. Furthermore, open-shell reactions play a key role in electro-catalysis and photoredox catalysis. Our group is devoted to developing this field. In this presentation we focus on C-C & C-N bond formation reactions



proceeding via “substrate radical” intermediates that are capable of C-H bond activation. Activation of carbene and nitrene precursors by planar, low-spin cobalt(II) complexes leads to formation of so-called carbene or nitrene radical intermediates.¹ These are intrinsically reactive metal-bound carbon or nitrogen centered radicals, useful for catalytic synthesis of a variety of ring compounds and other useful organic building blocks. These reactions have in common that they all proceed via selective radical-type transformations and single-electron elementary steps uncommon in traditional organometallic chemistry. The reactive radical-type intermediates are useful in organic synthesis, and mediate a variety of one-pot catalytic transformation leading to among others 2*H*-chromenes,² indenes, piperidines,³ dihydronaphthalenes,⁴ butadienes⁴ and dibenzocyclooctenes.⁵



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