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Strategies for Hydrocarbon Manipulation:
from alkane functionalization
to olefin cycloaddition

Abstract
Our modern daily lives use the hydrocarbon products of the petroleum industry constantly – from fuels to fragrances and even pharmaceuticals. Their abundance and ubiquity sparks the need to develop new modes of reactivity from these molecular frameworks that contain minimal functionality. Three distinct strategies of hydrocarbon manipulation will be discussed, 1) development of N-halo amide reagents for the sterically and electronically selective halogenation of unactivated, aliphatic C-H bonds, 2) the use of amidoxyl radicals as a general platform for alkene difunctionalizations, and 3) development of pyridine di(imine) iron and cobalt dinitrogen complexes as catalysts for thermal [2+2] cycloadditions of commodity olefin feedstocks.