Efficient Functionalization of Aminocyclopropanes

Significance: A judicious choice of both ligand and directing group (DG) plays an important role in the reactivity, regioselectivity, and stereoselectivity of a C–H functionalization reaction, with the cyclometalation typically dictating the observed regioselectivity. Whereas five-membered metallacycles are common, examples of asymmetric C–H functionalizations involving four- or six-membered rings are rare. The current report describes a method for the C–H borylation of aminocyclopropanes and the identification of a suitable DG for achieving selective C–H borylation while avoiding competing σ-bond hydroboration.

Comment: Several potential DGs were evaluated with the succinimide leading to selective borylation of the vicinal C(sp³)–H bond under iridium-catalyzed conditions, albeit with only 9% ee. Optimization of the ligand by increasing the steric bulk of the ortho substituent on the N-aryl ring led to significantly enhanced enantioselectivities, whereas tuning of the pyridine C5 substituent permitted a range of both N-protecting groups and α-substituents to be tolerated in the process. A gram-scale preparation and several synthetic applications of the products are demonstrated through both manipulation of the DG and cross-coupling of the BPin moiety.

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