

# **Platinum as a Matchmaker: Investigations of how transition metals catalyze carbon-carbon bond formation and how carbon hybridization affects coupling rates**

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From pharmaceutical synthesis (where joining small carbon fragments to make bigger fragments is a core competency of synthetic chemists) to the production of synthetic gasoline from natural gas or coal (where zipping carbons into a chain or splitting and recombining chains is the whole process itself), carbon-carbon bond formations catalyzed by platinum group metals are ubiquitous. In spite of this and many years of research, our understanding of such processes falls far short of the kind of understanding that we have of basic organic chemistry mechanisms, and our conventional wisdom consequently needs frequent updates. One such belief is that  $sp^2$  couplings are dramatically more facile than  $sp^3$  couplings; results will be discussed which suggest that it is not so simple, and that  $sp^3$  couplings can be nearly as fast as  $sp^2$  couplings, if not faster in some cases.