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Catalytic C–C Bond Formation



The topic of this Special Issue is of central concern to all practicing synthetic chemists. Access to the appropriate carbon skeleton of a target molecule in most cases requires carbon-carbon bond formation, and the frontiers of organic synthesis research have generally followed closely on the heels of new methodology for C–C bond construction. Classical synthetic methods most often relied on the generation of carbon-centered nucleophiles as main group organometallics (especially Grignard and organolithium reagents) or enolates and their equivalents. Questions of absolute stereocontrol were rarely addressed in the context of classical C–C bond forming reactions. The articles in this issue reflect two important modern research trends: C–C bond construction through application of organotransition metal-based methods and in the context of asymmetric catalysis.

The extraordinary advances made over the past several years in transition metal-catalyzed C–C bond-forming reactions have had the deepest impact on modern organic synthesis. While cross-coupling, Heck and metathesis reactions have been covered in previous special issues of *Advanced Synthesis & Catalysis*, the articles here include breakthrough results in other significant, although generally less well established, transition metal-based methods.

Asymmetric catalysis of C–C bond-forming reactions is described in a significant fraction of the papers in this issue. These cover an impressive range of modern synthetic methods, including organotransition-metal chemistry, organocatalysis, main group and transition metal Lewis acid catalysis.

Finally, we are confident that the value of this Special Issue to the synthetic community will be ensured by the timely review updating the extraordinary progress being made in stereoselective construction of quaternary stereocenters.

In many ways, the advances described in the following papers serve to underline the progress that still needs to be made. For example, efficient access to complex structures from simple precursors should benefit from discovery of tandem C–C bond-forming reactions. Enormous opportunities remain for development of chemo-, enantio- and regioselective transformations with broad substrate scope and functional group tolerance. Few asymmetric catalytic C–C bond-forming reactions have yet had the impact on industrial synthesis that is now enjoyed by more mature technologies (e.g., asymmetric hydrogenation), but this situation should change in the years to come. We hope the rich diversity of C–C bond-forming chemistry described in this issue will not only prove valuable to you in your own work, but also serve to inspire future advances in the field.

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