A bit of boron, a pinch of palladium: One-stop shop for the Suzuki reaction

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Carbon-containing compounds are at the heart of organic chemistry, and carbon is the basis of all living matter. However, the so-called Suzuki reaction provides a simple means of creating carbon-carbon bonds to form compounds that can serve as the starting points for the synthesis of an infinite variety of organic molecules.

A team of researchers led by chemist Professor Paul Knochel from Ludwig-Maximilians-Universitaet (LMU) in Munich has recently developed a practical and general method for the synthesis of a class of intermediates that readily undergo the Suzuki reaction. "The new method is broadly applicable to diverse starting compounds and is very economical because it produces very few unwanted byproducts," says Knochel. "It should also be of great interest in an industrial setting, where Suzuki reactions are used in the development of medicinal compounds and novel materials such as liquid crystals for display screens."

The Suzuki reaction – which involves the use of palladium to catalyze the cross-coupling of organoboron compounds with organic halogen-containing molecules – makes it possible to link carbon atoms together in a very straightforward way. The products of the reaction can then be utilized for the construction of a virtually unlimited number of organic substances. The Suzuki reaction thus forms the basis for the synthesis of novel drugs and innovative materials. Akira Suzuki was awarded the Nobel Prize in Chemistry for his discovery of the reaction that bears his name.

Knochel and his team were hoping to extend the applicability of the reaction by finding an easy, economical and general way to synthesize the necessary organoboron compounds so that they could be used in Suzuki reactions without further purification. "We were able to optimize the process in such a way that the boronates can be made in a one-pot reaction", says Christoph Sämann, who made a major contribution to the study. "The method works well under very mild conditions, is compatible with many different functional groups and can therefore be applied to a wide range of compounds."

In contrast to the organoboronates that have been used so far, the products generated via the new synthetic route have two organic groups attached to the boron atom, and both can be transferred, without loss, in the course of the subsequent Suzuki reaction. "This significantly improves overall yields, making the reaction much more economical," says Knochel. "The new reaction also produces less waste, which is an especially important consideration in industrial applications." (suwe)

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