

Semiconductor photocatalyst helps to realize borylation reaction

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A research group led by Prof. Dai Wen from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences (CAS) has realized borylation reactions involving N-heterocyclic carbene boranes (NHC-BH₃) with a simple and efficient heterogeneous photocatalytic system, enabling synthesis of high-value transformations including hydroboration and boron substitution products. Their study was published in *Angewandte Chemie International Edition* on Aug. 9.

NHC-BH₃ are novel boron sources in free radical borylation reactions due to their stable chemical properties and straightforward preparation



method. However, the application of NHC-BH³ is hindered by the requirement of a large quantity of harmful free radical initiators, as well as the expensive and non-recyclable homogeneous photocatalysts.

For this study, the researchers used cadmium sulfide nanosheets, which were easily prepared, as heterogeneous photocatalysts. And they served NHC-BH₃ as a boron source, enabling the selective borylation reaction of various alkenes, alkynes, imines, aromatic (hetero) rings, and bioactive molecules under <u>room temperature</u> and <u>light conditions</u>. Since the <u>conversion process</u> fully utilized photogenerated electron-hole pairs, the need for sacrificial agents was eliminated.

Furthermore, they found that the photocatalytic system could not only achieve gram-scale scale-up, but also maintain a stable yield after multiple cycles of the catalyst. It could also serve as a recyclable general platform, allowing the recovered catalyst to continue catalyzing different kinds of substrates.

"Our study provide new ideas for the development of free radical borylation reactions using NHC-BH₃ as a boron source, and the organoboranes obtained from the reaction may be used to synthesize synthetic building blocks that contain <u>hydroxyl</u>, borate, and difluoroborane reactive sites," said Prof. Dai.

More information: Fukai Xie et al, Facile Borylation of Alkenes, Alkynes, Imines, Arenes and Heteroarenes with N-Heterocyclic Carbene-Boranes and a Heterogeneous Semiconductor Photocatalyst, *Angewandte Chemie International Edition* (2023). DOI: 10.1002/anie.202306846

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