

## Mechanochemical Organic Synthesis: A Revolution Platform

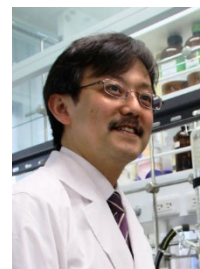
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### ABSTRACT

Mechanochemical reactions have recently attracted attention as a new platform for the development of environmentally friendly organic reactions, as they can significantly reduce the usage of organic solvents and reduce the reaction times. Furthermore, by exploiting the unique environment of mechanochemical reactions, new reactions that cannot be found in solvents are expected to develop. It is expected that many organic chemists will make use of mechanochemical reactions in the future. The limited number of reactions tend to be used more frequently than others in the synthesis of organic compounds. It thus would be useful to focus on the most widely used reactions. The Suzuki-Miyaura and Hartwig-Buchwald couplings are extremely important reactions, representing 32% of those used in drug discovery. However, under mechanochemical conditions, catalyst deactivation and poor reactivity with solid substrates has been a problem. We found that the addition of 1,5-COD and heating conditions dramatically improve the efficiency of these cross-coupling reactions of solid substrates.<sup>1-4</sup> Grignard reaction is one of the fundamental and most widely used organic reactions developed by Victor Grignard 120 years ago. To conduct this reaction mechanochemically, we thoroughly investigated the reaction conditions and achieved almost the same reactivity as the Grignard reagent synthesized in solution under ball mill conditions.<sup>5</sup> We also developed mechano-redox reactions that mimics the photoredox reaction, which has attracted much attention recently, using piezoelectric materials.<sup>6,7</sup> Mechanochemical polymer functionalization will also be presented.<sup>8</sup>

### REF.

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