Epitaxial synthesis of boron-containing Lewis acid material

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Boron-containing materials have been developed, and generally show Lewis acidity Thus, those materials applied to a wide variety of applications such as anion sensors, electronic devices, and catalysts.[1-3] Although those materials have unique properties, the proprtion of boron is low and to control the structure is difficulut. In our study, we aimed to synthesize a novel 2D material with high boron content in order to increase Lewis acidity. We expected that a lot of Lewis acid sites and high surface area of the 2D material improved the performance in application such as catalysts. We adopted bottom-up synthesis to tune material structure precisely. Triethynylborane·pyridine (teb·py) complex was chosen as monomer because of its high boron content (B:C= 1:6). poly(phenyl)borane (**$(BC_6)_n$**) was synthesized by cyclotrimerization of alkynes (Figure 1). The release of pyridine was observed at 300 °C in TG-MS measurement (Figure 2). This result indicated that pyridine was strongly coordinated to Lewis acid sites on **$(BC_6)_n$**, and it was found that the Lewis acidity of **$(BC_6)_n$** emerged by this heat treatment.

References

[1] V. M. Suresh, A. Bandyopadhyay, S. Roy, S. K. Pati, T. K. Maji, *Chem. Eur. J.*, 21 (2015), 10799
[2] S. Kawai, S. Saito, S. Osumi, S. Yamaguchi, A. S. Foster, P. Spijker, E. Meyer, *Nat. Commun.*, 6, (2015), 6.
[3] Y. Lin, S. Wu, W. Shi, B. Zhang, J. Wang, Y. A. Kim, M. Endo, D. S. Su, *Chem. Commun*. 51, (2015), 13086

Figures

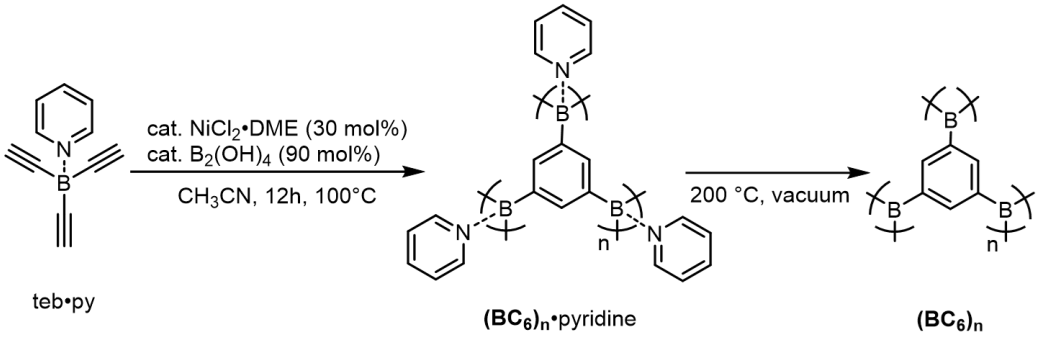

Figure 1: Synthesis route of **$(BC_6)_n$**

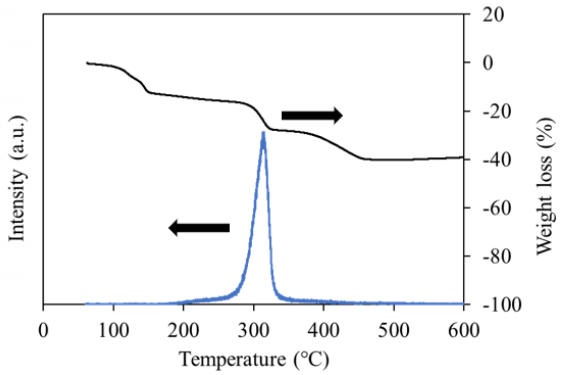

Figure 2: TG-MS measurement of **$(BC_6)_n$**·pyridine