Liquid phase exfoliation of rhombohedral boron monosulfide (r-BS) to two-dimensional BS nanosheets

([1]*Grad. Sch. of Pure and Appl. Sci., Univ. Tsukuba,* [2]*Dept. of Mater. Sci., Inst. of Pure and Appl. Sciences, Uni. Tsukuba,* [3]*NIMS,* [4]*TREMS, Inst. of Pure and Appl. Sci., Univ. Tsukuba,* [5]*R&D Ctr. for Zero CO_2 Emission with Funct. Mater., Univ. Tsukuba,* [6]*WPI-AIMR, Tohoku Univ.*)
○Jinyu Li[1], Osamu Oki[2], Mei Yuan[1], Natsumi Noguchi[1], Miwa Hikichi[2], Ryuki Tsuji[2], Masashi Miyakawa[3], Takashi Taniguchi[3], Takahiro Kondo[2,4,5,6]

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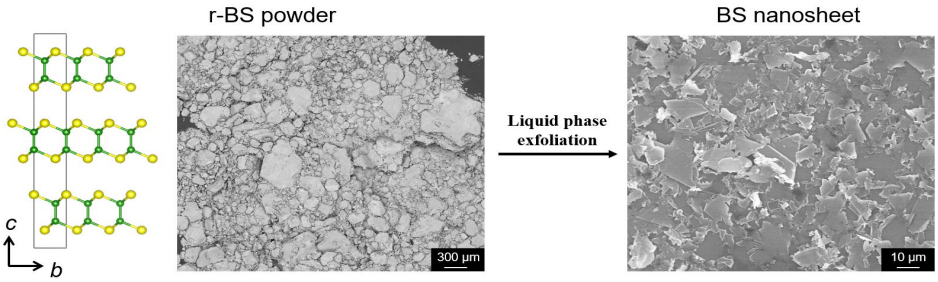
Two-dimensional (2D) nanosheets, featured with high surface area and unique electronic structures, have emerged as promising materials for advanced electronics, catalysis, and energy applications.[1] Boron-based 2D nanosheets offer an attractive platform with a variety of stable 2D phases depending on the combination of elements. Among these, 2D boron monosulfide (BS) is an intriguing material theoretically predicted to exhibit superconductivity, exceptional thermoelectrics, and high hydrogen storage capacity.[2] In this context, we previously reported the successful synthesis of rhombohedral boron monosulfide (r-BS) using high-pressure synthesis method.[4] Intriguingly, r-BS just kept in acetonitrile solution was found to exfoliate slightly, yielding BS nanosheets in the supernatant. However, the yield is considerably low, and the efficient exfoliation of r-BS remains challenging.

In this work, we attempted liquid phase exfoliation of multi-layered r-BS to BS nanosheets showing high surface area on a premise of a high hydrogen storage application. r-BS was prepared according to the reported procedures.[2] Briefly, a mixture of powdered sulfur and amorphous boron in a 1:1 atomic ratio was heated to 1873 K at 5.5 GPa and then quenched to room temperature. To attempt a progressive liquid phase exfoliation, r-BS (30 mg) was put in 10 mL of acetonitrile and homogenized with different time (from 0.5 to 4 hours), and the resulting supernatant was separated. Scanning electron microscopy (SEM) images of the spin coated sample homogenized for 4 hours clearly show the presence of the thin layered nanosheets, indicating that liquid phase exfoliation of r-BS was successfully achieved through homogenization. In the poster presentation, the detail of the exfoliation and further characterizations will be shown.



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