Synthesis and Characterization of Porous Boron Nitride Having Specific Gas Adsorption Properties

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Boron nitride (BN) is a fine ceramic material used in a wide variety of fields. From chemical and physical points of view, BN is an isoelectronic compound with carbon and crystalline structure of hexagonal BN (h-BN) is quite similar to that of graphite, but it is an insulator and forms atomically heterogeneous basal plane. Recent progress in synthetic methods has been able to provide nanoporous BN (p-BN) materials with high specific surface area constructed by fine crystallites of h-BN.[1] Lately, we have succeeded in revealing gas adsorption properties of p-BN that interact with N_2 molecules stronger than that of activated carbons.[2] Although the results indicate that p-BN will be a practical material for gas adsorption and separation, there is a crucial issue; p-BN needs development of the method to control pore size or surface chemistry. In our presentation, we first introduce the gas adsorption properties of p-BN and subsequently discuss possibilities to actively control its pore structure and surface properties through optimization of synthetic methods.

Regarding the typical synthesis route[1], we examined the effect of a gas atmosphere during the calcination process. A result is shown in **Figure** suggesting the effect of the gas species used in the calcination process. Interestingly, when we choose CO_2 as a flow gas, the specific surface area of micropore of p-BN (p-BN-CO_2) were about 1/10 of p-BN synthesized under the N_2- or Ar-flow conditions (p-BN-N_2 and p-BN-Ar) at the same temperature (*i.e.* 1473 K), but its mesopore structure has remained almost intact. The result supports that we can control the pore structure of p-BN by the synthetic conditions even for a thermally durable BN material. Dependences of other conceivable conditions like precursor species and calcination temperature will be also discussed in the presentation.

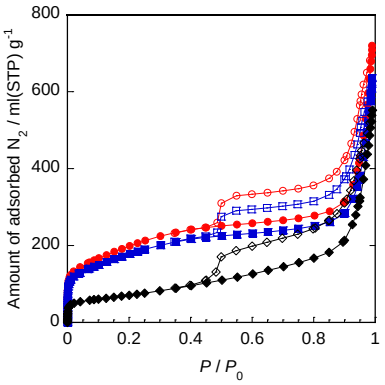

Figure Adsorption-desorption isotherms of N_2 on p-BN-N_2 (red), p-BN-Ar (blue), and p-BN-CO_2 (black) at 77 K.

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