= C6v ; space group =
P63mc) has the same structure as lonsdaleite , a rare hexagonal polymorph of carbon . As in the cubic form , the boron and nitrogen atoms are grouped into tetrahedra , but in w @-@ BN the angles between neighboring tetrahedra are different .

= = Properties = =

= = = Physical = = =

Sources : amorphous BN , crystalline BN , graphite , diamond .
The partly ionic structure of BN layers in h @-@ BN reduces covalency and electrical conductivity , whereas the interlayer interaction increases resulting in higher hardness of h @-@ BN relative to graphite . The reduced electron @-@ delocalization in hexagonal @-@ BN is also indicated by its absence of color and a large band gap . Very different bonding ? strong covalent within the basal planes (planes where boron and nitrogen atoms are covalently bonded) and weak between them ? causes high anisotropy of most properties of h @-@ BN .
For example , the hardness , electrical and thermal conductivity are much higher within the planes than perpendicular to them . On the contrary , the properties of c @-@ BN and w @-@ BN are more homogeneous and isotropic .
Those materials are extremely hard , with the hardness of bulk c @-@ BN being slightly smaller and w @-@ BN even higher than that of diamond . Polycrystalline c @-@ BN with grain sizes on the order of 10 nm is also reported to have Vickers hardness comparable or higher than diamond . Because of much better stability to heat and transition metals , c @-@ BN surpasses diamond in mechanical applications , such as machining steel . The thermal conductivity of BN is among the highest of all electric insulators (see table) .
Boron nitride can be doped p @-@ type with beryllium and n @-@ type with boron , sulfur , silicon or if co @-@ doped with carbon and nitrogen . Both hexagonal and cubic BN are wide @-@ gap semiconductors with a band @-@ gap energy corresponding to the UV region . If voltage is applied to h @-@ BN or c @-@ BN , then it emits UV light in the range 215 ? 250 nm and therefore can potentially be used as light @-@ emitting diodes (LEDs) or lasers .
Little is known on melting behavior of boron nitride . It sublimates at 2973 ° C at normal pressure releasing nitrogen gas and boron , but melts at elevated pressure .

= = = Thermal stability = = =

Hexagonal and cubic (and probably w @-@ BN) BN show remarkable chemical and thermal stabilities . For example , h @-@ BN is stable to decomposition at temperatures up to 1000 ° C in air , 1400 ° C in vacuum , and 2800 ° C in an inert atmosphere . The reactivity of h @-@ BN and c @-@ BN is relatively similar , and the data for c @-@ BN are summarized in the table below .
Thermal stability of c @-@ BN can be summarized as follows :
In air or oxygen : B_2O_3 protective layer prevents further oxidation to ~ 1300 ° C ; no conversion to hexagonal form at 1400 ° C.
In nitrogen : some conversion to h @-@ BN at 1525 ° C after 12 h .
In vacuum (10 ? 5 Pa) : conversion to h @-@ BN at 1550 ? 1600 ° C.

= = = Chemical stability = = =

Boron nitride is insoluble in the usual acids , but is soluble in alkaline molten salts and nitrides , such as LiOH , KOH , NaOH @-@ Na_2CO_3 , $NaNO_3$, Li_3N , Mg_3N_2 , Sr_3N_2 , Ba_3N_2 or Li_3BN_2 , which are therefore used to etch BN .

= = = Thermal conductivity = = =

The theoretical thermal conductivity of hexagonal Boron nitride nanoribbons (BNNRs) can approach 1700 ? 2000 W / (m · K) , which has the same order of magnitude as the experimental measured value for graphene , and can be comparable to the theoretical calculations for graphene nanoribbons . Moreover , the thermal transport in the BNNRs is anisotropic . The thermal conductivity of zigzag @-@ edged BNNRs is about 20 % larger than that of armchair @-@ edged nanoribbons at room temperature .

= = Natural occurrence = =

In 2009 , a naturally occurring boron nitride mineral (proposed name qingsongite) was reported in Tibet . The substance was found in dispersed micron @-@ sized inclusions of qingsongite (c @-@ BN) in chromium @-@ rich rocks in Tibet . In 2013 , the International Mineralogical Association affirmed the mineral and the name .

= = Synthesis = =

= = = Preparation and reactivity of hexagonal BN = = =

Boron nitride is produced synthetically . Hexagonal boron nitride is obtained by the reacting boron trioxide (B2O3) or boric acid (B (OH) 3) with ammonia (NH3) or urea (CO (NH2) 2) in a nitrogen atmosphere :