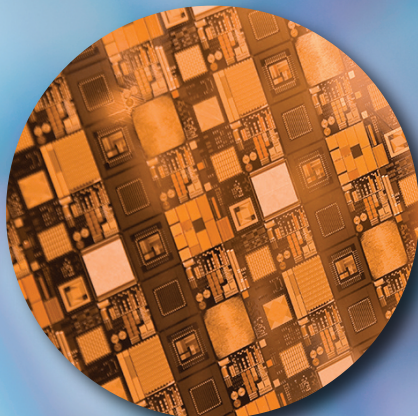
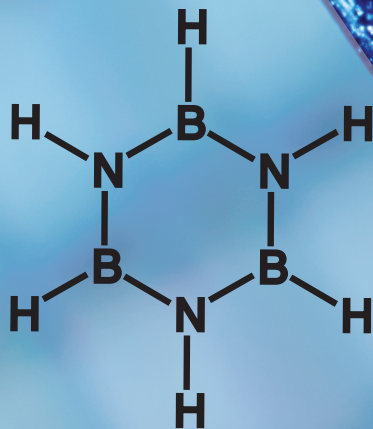
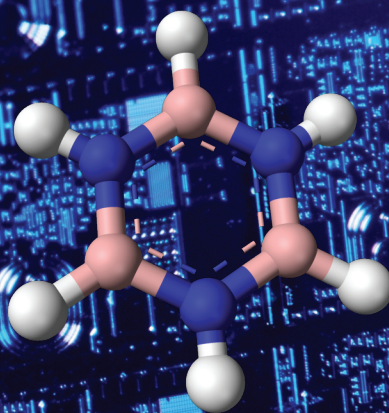


# Gelest

*Enabling Your Technology*

# BORAZINE

*the simple solution for boron nitride™*



- Preferred precursor for hexagonal boron nitride (h-BN) films
- No carbon by-products upon formation of boron nitride

*Forms h-BN films with:*

- Wide band gap (5.955 eV)<sup>1</sup>
- High Thermal and Chemical Stability
- High Electrical Resistivity, Thermal Conductivity, Thermal Shock Resistance

*Also available: Trimethylborazine*

## ***Borazine***

Gelest has a long history of producing borazine and is the leading supplier of borazine worldwide. Borazine is the preferred precursor for hexagonal boron nitride (h-BN) films as it has the correct B-N ratio, a B-N ring structure, and no carbon by-products upon formation of boron nitride. Hexagonal boron nitride is a material of great interest due to its wide band gap (5.955 eV)<sup>1</sup>, high thermal and chemical stability, high electrical resistivity, high thermal conductivity, and high thermal shock resistance. Two dimensional (2D) h-BN films can be grown by chemical vapor deposition (CVD) of borazine on a copper or nickel foil substrate.<sup>2,3,4</sup>

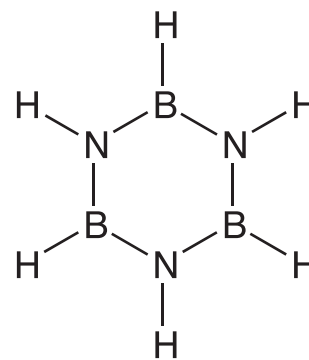
## ***Applications of Hexagonal Boron Nitride Produced from Borazine***

Hexagonal boron nitride films produced by CVD of borazine have been explored in several applications including semiconductors, optoelectronics, and high temperature ceramic coatings among others.<sup>5</sup> Jang, et al. have demonstrated the use of h-BN films as gate dielectrics and measured the dielectric constant of h-BN films of varying thicknesses between gold substrates on a SiO<sub>2</sub>/Si substrate. The dielectric constant was 3-4 and was independent of film thickness (1.2 nm – 30 nm).<sup>4</sup> Separately, Bao, et al. have investigated the heat dissipation capacity of h-BN films for use as lateral heat spreaders in electrically insulating packaging applications. Single layer films grown by CVD on a SiO<sub>2</sub>/Si substrate showed better cooling efficiency compared to micron films prepared by dispersion of boron nitride powder.<sup>6,7</sup>

## **Properties of Borazine and Trimethylborazine**

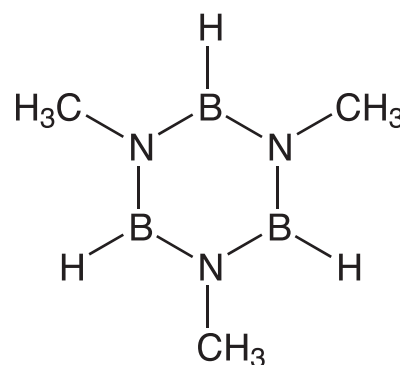
### **Borazine**

Product Code: INBO009  
Boiling point: 55°C / 0.08 mm Hg  
Melting point: -58°C  
Density: 0.81 g/mL



### **1,3,5-Trimethylborazine**

Product Code: OMBO061  
Boiling point: 133°C / 1 mm Hg  
Melting point: -7°C  
Density: 0.888 g/mL



- Packaged in stainless steel bubbler or cylinder
- Custom packaging available including in your cylinder or bubbler
- Contact Gelest to request custom synthesis of other borazine derivatives

**Stainless Steel  
Bubblers**



**Stainless Steel  
Bulk Cylinders**





## References

- (1) Cassabois, G. et al., *Nature Photonics* 2016, 10, 262-266.
- (2) Gibb, A.L. et al., *Microscopy and Microanalysis* 2014, 20, 1770-1771.
- (3) Wu, Q.W. et al., *Nanoscale* 2015, 7, 7574-7579.
- (4) Jang, S.K. et al., *Scientific Reports* 2016, 6:30449, 1-9.
- (5) Bonifazi, D. et al., *Chem. Commun.* 2015, 51, 15222-15236.
- (6) Bao, J. et al., *J. Phys. D: Appl. Phys.* 2016, 49 (26), 265501.
- (7) Bao, J. et al., *Electron. Mater. Lett.* 2016, 12 (1), 1-16.

**For additional information on Gelest's Borazine and other organometallic materials or to inquire on how we may assist in *Enabling Your Technology*, please contact:**



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