Boron nitride

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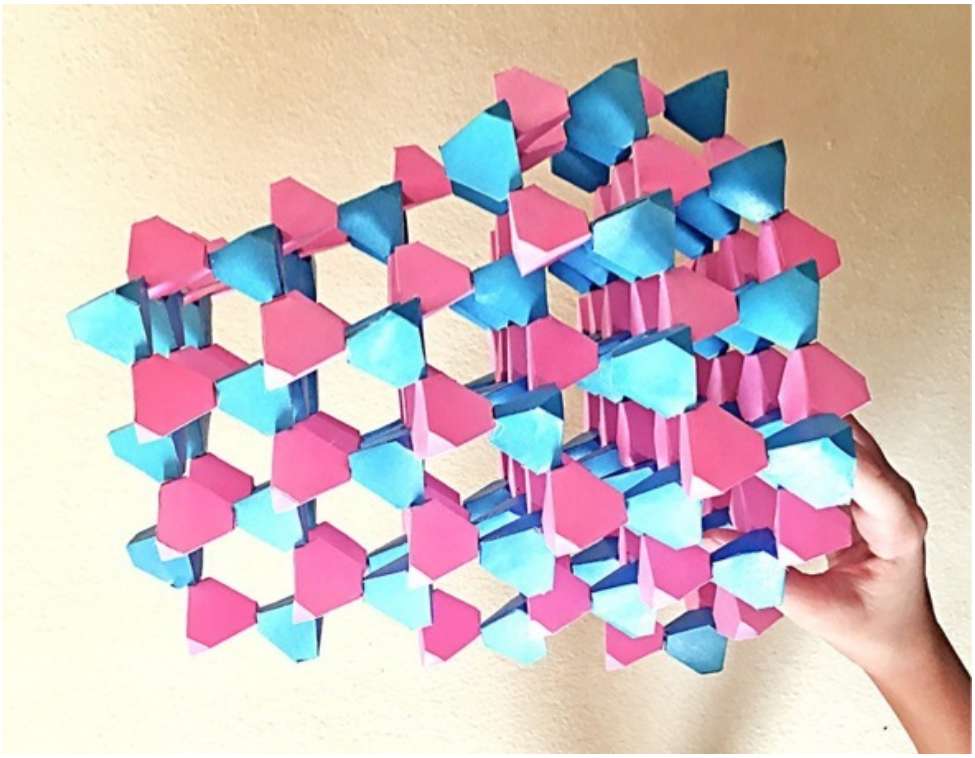
Boron has three elections in the outer shell and nitrogen has five so Boron nitride is isoelectronic with carbon. BN exists in two common forms: a hard high melting-point ceramic type material used for making high-temperature crucibles and a soft compound that in powdered form is a lubricant, commonly known as *white graphite*.

A high-temperature boron nitride crucible
that molten metals and salts do not wet.

Boron nitride is a versatile compound with unusual and useful properties in many applications and is of commercial importance. Its hardness (in the diamond structure) is next to that of diamond and it's used in drill bits. A web search returns may sites with descriptions of properties and images.

Boron nitride in the cubic structure can be modelled with our carbon single-bond nets painted pink (boron) and blue (nitrogen). The cyclohexane rings that were used to make the diamond structure are put together with alternating pink and blue models using the same three-hole construction aid. The hexagonal rings in the chair form are then glued in place with alternating pink and blue to make the three dimensional cubic structure of diamond with hexagonal channels.

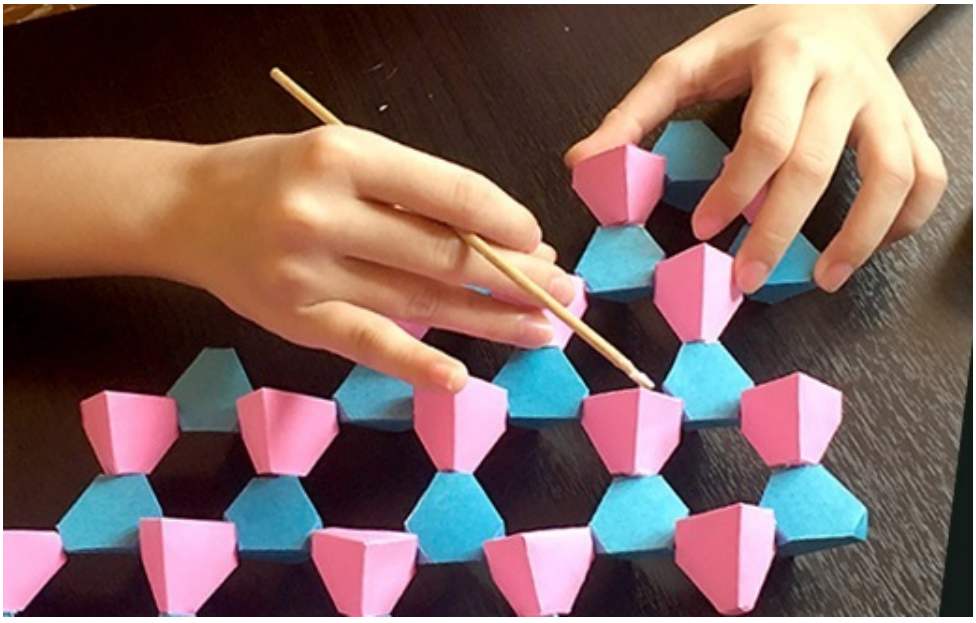
The cubic structure of boron nitride



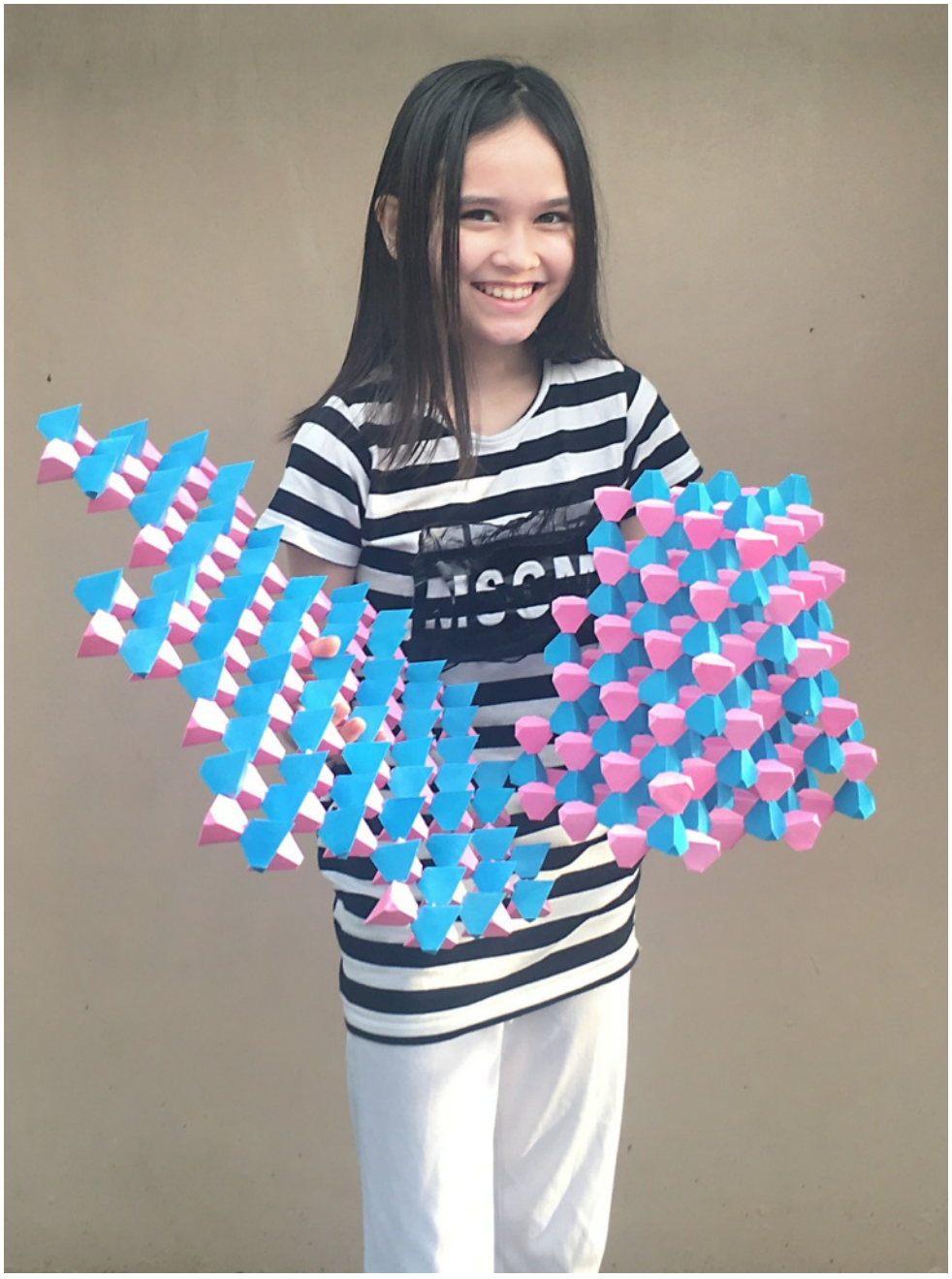
The model is identical to that of diamond with hexagonal rings, channels and cleavage planes.

White graphite

My first attempt to model the soft form of boron nitride used the nets from our initial attempt to model benzene.



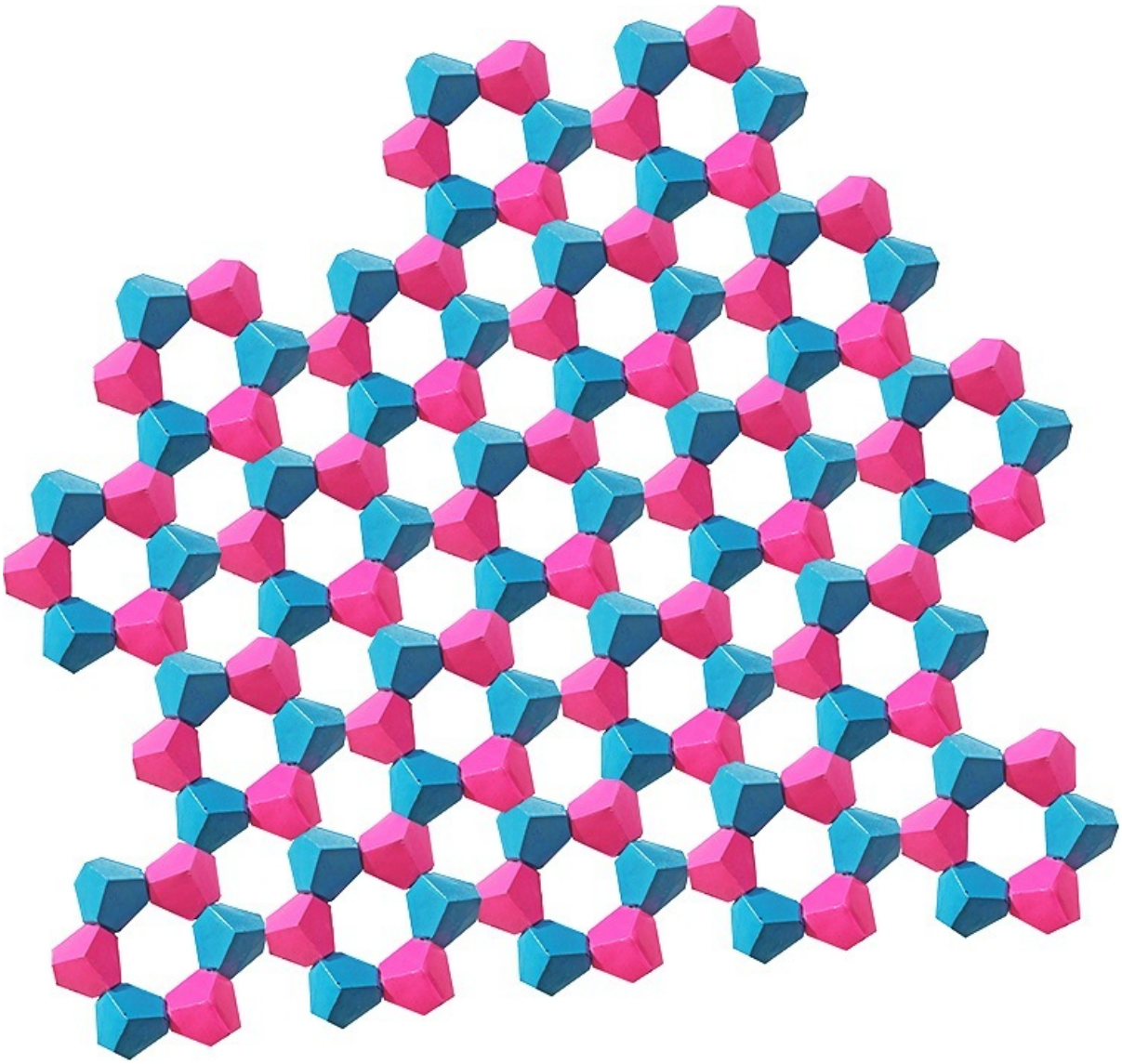
The result was pleasing graphically but was not symmetrical. One side is blue and the other is pink in the image below.



We were happy with the model of the diamond structure of BN but not with the hexagonal structure (left) analogous to graphite.

The result prompted a rethink of the way we had chosen to model a benzene ring and led to redrawn nets in two parts to better represent the flat regular hexagonal structure of benzene. These modified nets were then use to better model BN in this form.

The second attempt at the graphite crystal structure of BN using the new nets that better represent the special case of benzene bonding is shown below.



An improved model of boron nitride in the graphite form.

Note: the two-part nets linked below are best put together without pre-painting the paper. Sets of six finished white items are then very lightly glued into hexagonal rings and spray painted pink (or blue) on both sides. The painted rings are taken apart, glued firmly with alternating colours and are easily put together by hand into a flat sheet. This method gives a more professional looking result than pre-painting the sheets of nets before cutting and folding.