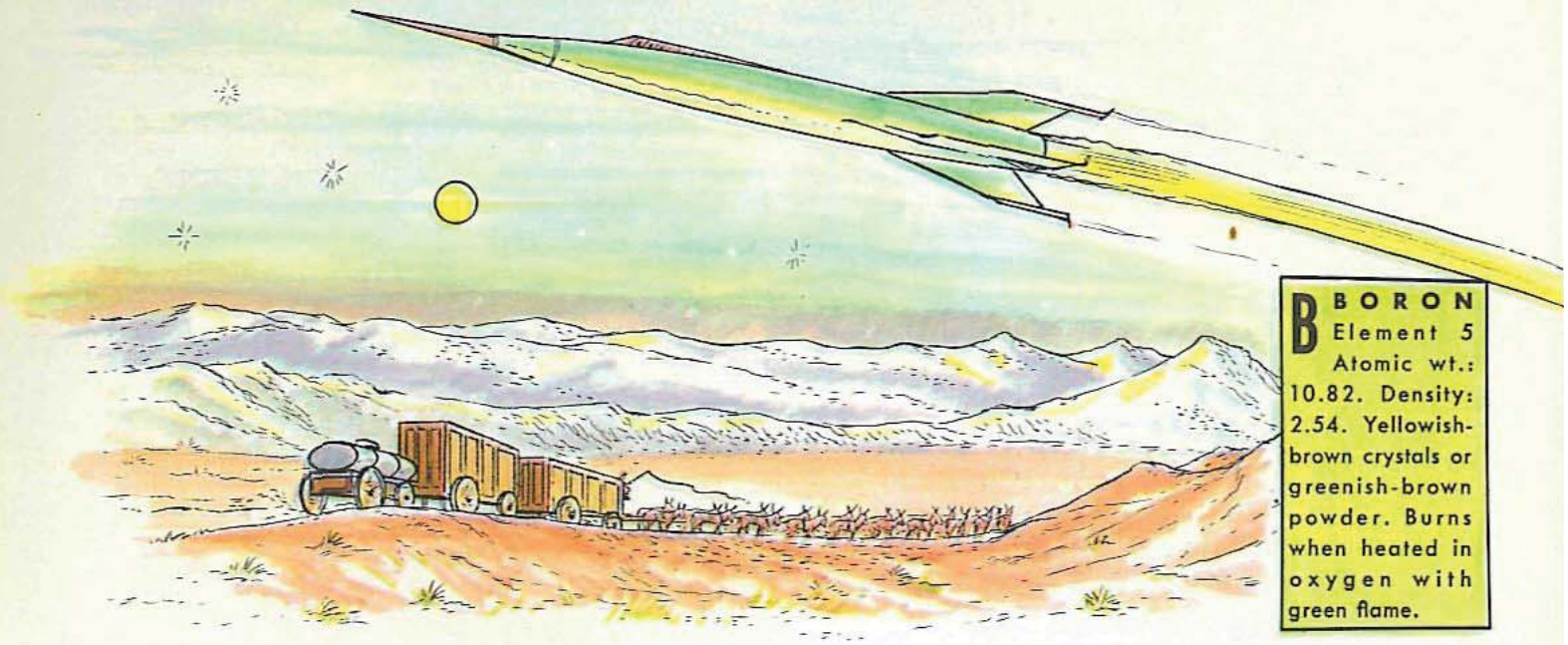


B BORON Element 5 Atomic wt.: 10.82. Density: 2.54. Yellowish-brown crystals or greenish-brown powder. Burns when heated in oxygen with green flame.

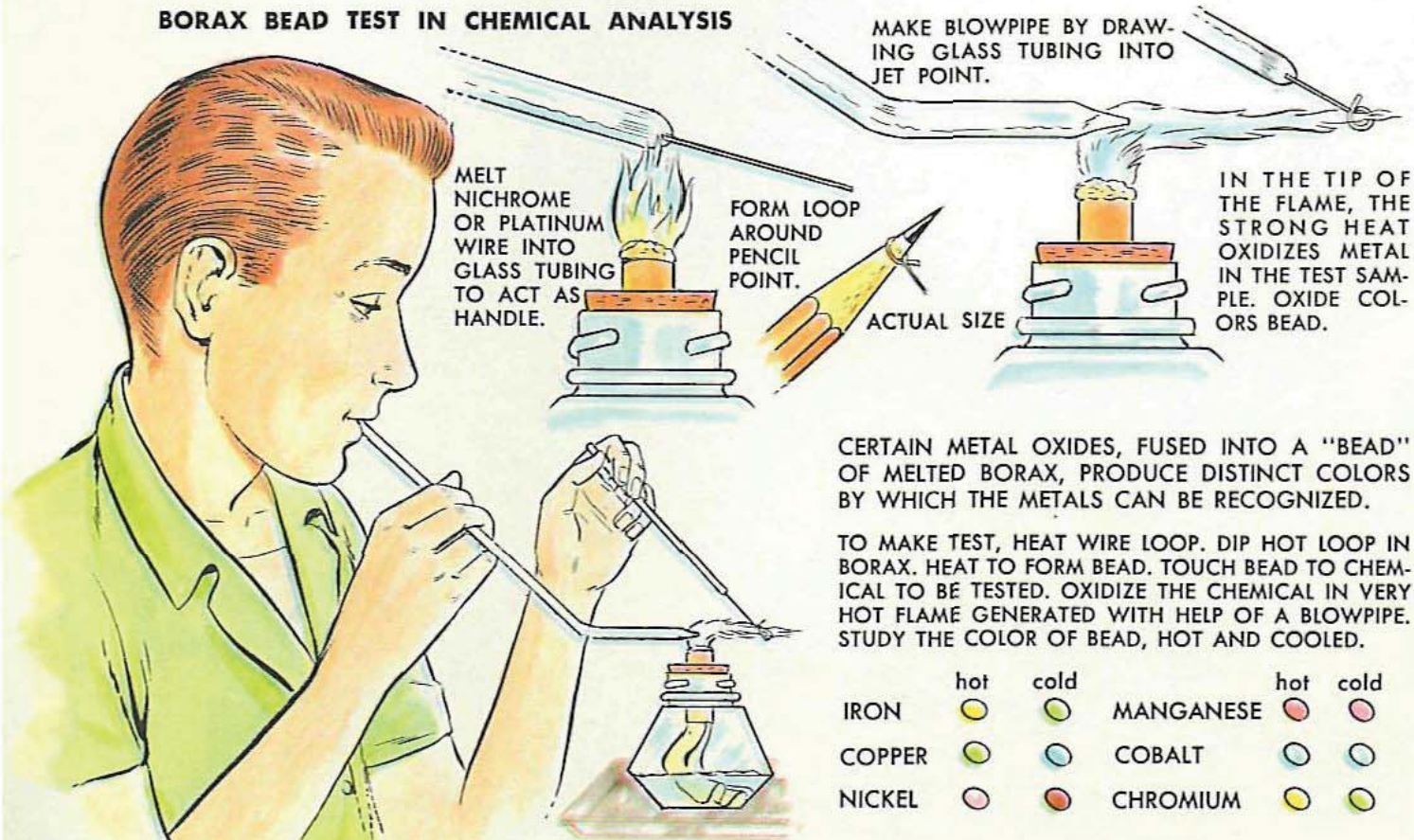
Boron—Future Rocket-Power Element?

LESS THAN A hundred years ago, a mineral called borax, containing the element boron, was carted out of Death Valley in California by twenty-mule teams — about the slowest transportation you can think of. Someday, boron may be put in zip-fuels for space missiles — the fastest form of transportation imaginable. Boron has the ability (as does carbon) to combine with hydrogen in a number of ways. When these boranes or boron hydrides burn, they develop a tremendous amount of power.

Boron can be isolated as a hard, brownish-black powder. Its carbon compound, boron carbide (B_4C), is almost as hard as diamond.

But you are probably more familiar with boron

BORAX BEAD TEST IN CHEMICAL ANALYSIS



CERTAIN METAL OXIDES, FUSED INTO A "BEAD" OF MELTED BORAX, PRODUCE DISTINCT COLORS BY WHICH THE METALS CAN BE RECOGNIZED.

TO MAKE TEST, HEAT WIRE LOOP. DIP HOT LOOP IN BORAX. HEAT TO FORM BEAD. TOUCH BEAD TO CHEMICAL TO BE TESTED. OXIDIZE THE CHEMICAL IN VERY HOT FLAME GENERATED WITH HELP OF A BLOWPIPE. STUDY THE COLOR OF BEAD, HOT AND COOLED.

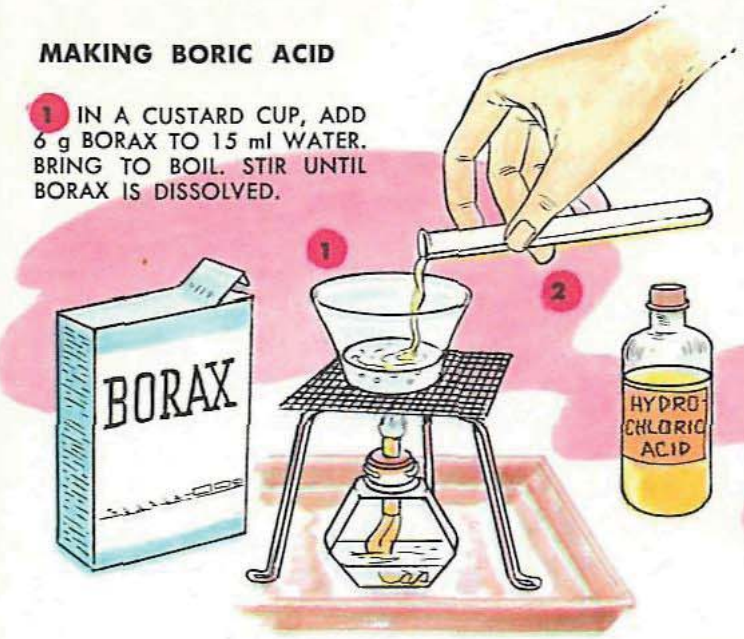
	hot	cold		hot	cold
IRON			MANGANESE		
COPPER			COBALT		
NICKEL			CHROMIUM		

through two of its compounds which are found in almost every household: boric acid (H_3BO_3), used as a mild antiseptic, and borax (sodium tetraborate, $Na_2B_4O_7 \cdot 10H_2O$), used for cleaning purposes and as a water softener.

Borax has a great number of uses outside the home. It is used for soldering, for producing certain kinds of soap, and for making other boron compounds.

The glass industry uses large quantities of borax for making boron-aluminum-silicate glass. You know this kind of glass by its trade name, Pyrex. Kitchen utensils and laboratory ware made of Pyrex glass have the great advantage over ordinary glass that they can be placed directly on the fire and do not break so easily when they are subjected to sudden heating or cooling.

MAKING BORIC ACID

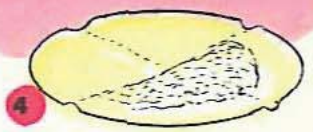


1 IN A CUSTARD CUP, ADD 6 g BORAX TO 15 ml WATER. BRING TO BOIL. STIR UNTIL BORAX IS DISSOLVED.

2 *ADD 4 ml* HYDROCHLORIC ACID TO HOT BORAX SOLUTION. STIR. REMOVE FROM FIRE. BORIC ACID CRYSTALLIZES OUT AS SOLUTION COOLS.

3 POUR CONTENTS OF CUSTARD CUP INTO A FILTER. WHEN FILTRATE HAS RUN OFF, WASH BORIC ACID REMAINING IN FILTER WITH A SMALL AMOUNT OF COLD WATER TO REMOVE NaCl ALSO FORMED IN THE PROCESS.

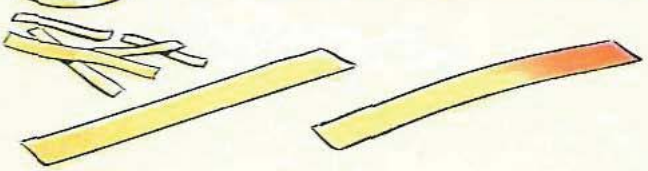
4 SPREAD OUT FILTER TO LET BORIC ACID CRYSTALS DRY. USE FOR EXPERIMENTS ONLY.



TESTS FOR BORIC ACID

DROP A FEW CRYSTALS OF BORIC ACID IN A CUSTARD CUP. ADD A COUPLE ml DENATURED ALCOHOL. IGNITE. STIR WITH GLASS ROD. BORIC ACID GIVES GREEN EDGES TO THE FLAMES.

YELLOW TURMERIC INDICATOR PAPER TURNS BROWN WITH BORIC ACID. YELLOW COLORING MATTER IN TABLE MUSTARD IS TURMERIC. TO MAKE TEST PAPER, DIP STRIPS OF PAPER TOWELING IN MUSTARD. WASH MUSTARD OFF. DRY STRIPS.



MAKING BORIC OXIDE

HEAT BORIC ACID IN AN OLD TEASPOON. IT GIVES OFF WATER AND TURNS INTO SYRUPY MASS OF MELTED BORIC OXIDE (B_2O_3) WHICH YOU CAN DRAW INTO THREADS WITH GLASS ROD.