



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

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Potential and Outlook

There are no records of significant occurrences of boron minerals in New South Wales.

Most of the world's major deposits occur in tectonically active zones, particularly rift valleys; highly saline shallow enclosed marine environments; and in saline inland basins as evaporate deposits, commonly in association with gypsum and salt. There are numerous saline lakes in inland New South Wales, and these have not been evaluated for borates.

Nature and Occurrence

Boron, like nearly all other non-metallic elements, does not occur in its elemental state. Historically, the most commercially important group of boron compounds has been borates obtained from evaporite deposits, specifically:

- borax $\text{Na}_2[\text{B}_4\text{O}_5(\text{OH})_4] \cdot 8\text{H}_2\text{O}$
- colemanite $\text{Ca}[\text{B}_3\text{O}_4(\text{OH})_3] \cdot \text{H}_2\text{O}$
- ulexite $\text{NaCa}[\text{B}_5\text{O}_6(\text{OH})_6] \cdot 5\text{H}_2\text{O}$

Common minerals, such as tourmaline, also contain boron, but have no economic potential because the boron content is usually very small. Boron is extremely dispersed in nature and rarely occurs in economically significant concentrations (Harben & Kužvar 1996).

Borates are more soluble than sodium chloride and potassium chloride and therefore typically are deposited in environments where the evaporation rate is high and water supply periodic (e.g. Death Valley in the USA). In such settings the final precipitate contains the most-soluble minerals. Economically significant concentrations are usually associated with local volcanic activity, which provides a source of boron. Major borate deposits are commonly found in tectonically active areas, particularly rift zones.

Large skarn deposits of the borosilicate minerals danburite ($\text{Ca}[\text{B}_2\text{Si}_2\text{O}_8]$) and datolite ($\text{CaBSiO}_4(\text{OH})$) have been found in Russia, and Tadzhikistan, associated with limestones and dolomites (Harben & Kužvar 1996). In those cases, the boron minerals may have formed from original evaporite deposits rather than from the dolomitic sediments.

Chemically, borates are considered to be salts and esters of boric acid. In industrial usage, borates are considered to include any substance with significant

boric oxide. Borax is the most important of the commercially exploited borates. (Natural borax is traditionally called tincal.)

World production of boron compounds in 2004 was 4.6 Mt (Lyday 2005). Production from evaporite deposits dominates international markets. Major producers are the USA (Cainozoic evaporite deposits in the Mojave Desert and Death Valley), Turkey (several Cainozoic evaporite deposits) and Russia (borosilicate skarn deposits), which together account for about 80% of global production. Other significant producers include Argentina, China and Chile.

Main Australian Deposits

There are no known economic deposits of boron minerals in Australia. However, boron is known to occur in concentrations of up to 2000 ppm in groundwater in parts of central Australia (Driessen 1987). Borax has also been recorded as a minor constituent in some evaporitic deposits in salt lakes in Western Australia.

New South Wales Occurrences

There are no specific records of boron-bearing waters or occurrences in New South Wales, and there has been no evaluation of the state's potential.

Applications

Boron and boron compounds have many applications, the major uses being in borosilicate glasses (used in cookware); the manufacture of glass fibre and fibreglass; ceramics; detergents and soaps; fertilisers; and chemical manufacture. For most applications, specifications are in terms of the content of B_2O_3 after initial processing (e.g. calcining of colemanite). About 50% B_2O_3 is required for borates used in the major applications.

Borates are essential minerals but markets and demand have traditionally been difficult to predict. This is largely because of the relatively small number of producers, and also because production of boric acid and other boron compounds is energy-intensive, and is sensitive to changes in energy prices.

Economic Factors

Only small amounts of natural borates are imported into New South Wales at present, while imports of borax are not known.

Demand for borates is strongly dependent on the performance of the world's construction industry, because the largest markets are in fibreglass, ceramic glazes and other glass products.

References

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