Potential and Outlook

New South Wales has widespread occurrences of carbonate rocks (cf. Limestone Chapter). Although there are numerous deposits of dolomitic limestone, true dolomites are relatively uncommon. Recent discoveries and mapping in the central Lachlan Orogen, however, indicate that there is excellent potential for major deposits of high-purity dolomite. In addition, there are immense deposits of potentially high-purity dolomite in the Corona area, north of Broken Hill. Dolomite occurrences are shown in the map in the Limestone Chapter of this bulletin (Figure 14).

There has been no systematic exploration for dolomite in the state, and most deposits which have been mined in the past were found during prospecting for limestone or marble.

In recent years large resources of high-grade sedimentary dolomite have been identified within the Mount Hope and Lucknow deposits (Figure 14), near Rylstone. The Lucknow deposit (unrelated to the locality of Lucknow) is the larger and appears to be of high purity.

The relative scarcity of dolomite in the state may be due to a lack of suitable environments, i.e. carbonate-bearing shelf sequences. In addition, many of the limestone deposits in the state were formed in deeper water settings not conducive to the formation of dolomite by replacement. However, recent geological mapping in the Rylstone and Bathurst areas has revealed several areas where carbonate-bearing shelf sequences do occur.

In the Rylstone area, mapping has shown that the host formation for the Lucknow deposit, the Glendale Limestone Member, is quite extensive. Similar units occur in the Mudgee–Buckaroo area, where dolomite has been mined in the past.

Mapping near Mumbil, southeast of Wellington, and near Palmers Oakey, north of Bathurst, has identified similar settings. These discoveries enhance the potential for further occurrences of dolomite in this region.

Dolomite is also known near Barraba, in the New England region, in several deposits associated with a serpentinite body. The dolomite was possibly formed by metasomatic alteration of pre-existing carbonate. Deposits of similar origin are mined on a large scale overseas.

There are extensive areas elsewhere in the state where serpentinites have been emplaced in sequences in which carbonates are common. Any carbonate bodies near or in contact with serpentinite could host further occurrences of dolomite. However, the potential for deposits similar to those near Barraba has never been evaluated.

Potentially high-purity dolomite occurs in enormous quantities in the Corona area, north of Broken Hill, in the Corona Dolomite, within the Adelaidean Euriowie Subgroup (Cooper et al. 1978). The Corona Dolomite crops out over large areas, from about 3 km south of Corona homestead to about 10 km north, with a maximum thickness of about 900 m. The formation consists of massive, buff to white, fine-grained dolomite, and total resources are immense (>100 Mt).

An analysis from the Corona deposit (exact location of sample unknown) indicated that the rock has a magnesium carbonate content of about 42%, indicating a true dolomite. The same analysis indicated 53% $CaCO_3$, 3.6% SiO_2 and 1.4% FeO.

These deposits have never been evaluated, probably because of their remote location. However, their sheer size and potentially high quality warrant additional consideration.

Nature and Occurrence

'Dolomite' is the term used for the mineral dolomite, $CaMg(CO_3)_2$, and the rock dolomite, which is a rock containing 90% or more of the mineral dolomite. The term dolostone is sometimes used for dolomite (the rock) to avoid confusion (e.g. O'Driscoll 1988). Dolomite rock has a similar appearance and outcrop to limestone, but is commonly distinctly pink or brown and, because the mineral dolomite is more resistant to weathering by dissolution, less likely to form karst landscapes. Rocks with less than 90% dolomite (the mineral) progressively grade into calcic dolomite, and dolomitic limestone.

It was once believed that dolomite rock formed by replacement of limestone, subsequent to deposition, and that this occurred at depth and over a long time. It was therefore thought that the older the limestone,

the more likely it was to be transformed into dolomite. However, this is belied by the great abundance of limestone of considerable age in New South Wales and the relative scarcity of dolomite.

It is now accepted that dolomite rock mainly forms near the time of deposition of the original limestone, by the replacement of calcite in the limestone by dolomite from magnesium-bearing seawater. The environment envisaged is a protected shallow marine basin or highly saline inland sea. Many of the New South Wales limestone deposits were formed as fringing coral reefs on the flanks of steep volcanic rises and steep-sided ocean trenches, an unsuitable environment for dolomite formation.

Some dolomites were formed by metasomatism at depth associated with ultramafic and other intrusions, and possibly with talc deposits, which form in similar environments.

Dolomite rock is common throughout the world, and many countries have significant production, typically associated with mining of such other carbonate rocks as limestone. Production of dolomite is often not reported separately from production of limestone, and it is difficult to ascertain overall amounts produced. However, it is clear that the most important dolomite deposits are associated with carbonate-bearing shallow marine sequences, whereas dolomites of metasomatic origin are less commonly mined. Many of the major overseas deposits, such as those in Pennsylvania, USA, formed in shelf environments.

Many countries have significant dolomite deposits and production, and the major producers include China, USA, Mexico, Spain, Norway and other European countries.

Main Australian Deposits

Dolomite is common in most Australian states, but has only been exploited on a large scale in South Australia and Tasmania, and on a moderate scale in New South Wales. Most of the occurrences quarried are sedimentary in origin, and are associated with limestone, but deposits of metasomatic origin associated with ultramafic intrusions are also known. The most important deposits are in the Ardrossan area on the Yorke Peninsula, South Australia, where thick sequences of high-grade dolomite associated with Cambrian limestone are extensively mined. In some other states (such as Western Australia, and the Northern Territory) extensive deposits of high-grade dolomite are also known, but in areas too remote for utilisation to be economic at present.

New South Wales Occurrences

There are 51 recorded occurrences of dolomite in New South Wales (Ray et al. 2003). Dolomite has been mined on a comparatively small scale at a number of localities (Carne & Jones 1919; Lishmund et al. 1986). Small quantities of dolomite are currently mined from deposits near Mudgee, mainly for use in agriculture, in the manufacture of insulation wool, and as a metallurgical flux.

Dolomite is known to occur at many locations, mainly in Siluro-Devonian sequences in the Lachlan Orogen, but also in the New England Orogen and in the Broken Hill region. Dolomite has been mined from deposits south of Queanbeyan, where small resources remain, and from a number of localities in the Bathurst and Cudgegong–Mudgee areas (Figure 14).

Table 8. Dolomite — uses and specifications

Physical state	Uses	Specifications (indicative)
Block/slab	Dimension stone	Joint-free, suitable colour/texture
Coarse crushed	Aggregate, terrazzo, metallurgical flux	Flux – CaO ~ 30%; MgO 17%; FeO 1.5%; max SiO_2 3%; max S< 0.1%
Fine-ground	Filler, chemicals, glass, water treatment, agriculture	FeO<0.2%, low other impurities, high whiteness
Half burnt (800–1000°C)	Fertiliser, Mg-based cements	CaO 30%, MgO 20%, low iron, alumina, silica, TiO_2<0.05%
Burnt (1100–1300°C)	Water treatment, chemicals, cement	As above
Dead burnt (1500–1600°C)	Refractories, chemicals	As above

Source: O'Driscoll (1988)

The largest known deposits are at Mount Hope and Lucknow, in the Rylstone area (Carne & Jones 1919; Lishmund et al. 1986). Other significant deposits occur in the Willi Willi area west of Kempsey, on the mid north coast. New South Wales dolomites have been considered to be mainly detrital in character, and to have formed virtually in-situ from the fragmentation of earlier replacement dolomite. Exceptions are the deposits near Barraba, which are thought to have formed by alteration associated with ultramafic intrusions, and the large Corona Dolomite deposits north of Broken Hill (Cooper et al. 1978), which are bedded deposits formed in-situ.

Applications

Dolomite shares many applications with limestone, including: filler material; whiting agent; metallurgical flux; fertiliser; and coarse aggregate (Table 8). Its differing physical and chemical properties lead to many other uses, including: as a source of high-magnesia refractories; as a source of magnesium metal and magnesium oxide (which have numerous applications); and in the glass and chemical industries. Globally, the major uses for limestone (and dolomite) are as coarse and fine aggregate, although in Australia the major uses have been in agriculture, refractories, and in the manufacture of plate glass.

Besides limestone used for agricultural purposes or as mineral fillers, the main alternative material to dolomite is magnesite and seawater magnesia (not manufactured in Australia).

Economic Factors

High-purity dolomite suitable for highly specialised applications naturally commands higher prices; dolomite for agricultural use somewhat lower and, for use as aggregate, even lower prices, similar to those obtained for other construction materials (perhaps A$15 to A$20 per tonne). It is difficult to ascertain prices obtained for higher grades of dolomite because production and marketing data are so commonly included under the general heading 'limestone' or 'carbonate rocks'. However, highest-grade dolomite suitable for use in such applications as glass or fillers may be worth several hundred dollars per tonne.

Given the large production of dolomite in many industrialised countries, and the distances involved, development of large overseas markets for Australian dolomite would be difficult except for the very highest grades of material, should suitable deposits be found.

New South Wales imports significant quantities of dolomite annually, mainly for metallurgical use. The Ardrossan deposit in South Australia is the major source.

Local and regional agricultural markets for dolomite could be further developed in parts of New South Wales, where soils are deficient in lime and magnesium.

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