

Western Australia's unique gemstones

by

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Introduction

Western Australia contains numerous rare and often unusual gemstones that are described in the new book, *Gemstones of Western Australia* (Fetherston et al., 2013). This publication is long overdue, since — apart from a series of small booklets on gemstones produced between 1975 and 1994 — a substantial and systematic work on gemstones in the State has not been produced by the Geological Survey of Western Australia since its formal inception in 1896.

The book is a joint publication between GSWA and the Gemmological Association of Australia in which the authors have assembled a comprehensive resource on virtually all gemstones and decorative stones used in jewellery and ornamental sculpture known in the State. Although diamonds command a certain pride of place in the Western Australian mining industry, far less is known about occurrences of gemstones such as emerald, aquamarine, turquoise, topaz, variscite and gaspeite. Also, decorative stones peculiar to the State such as zebra stone, orbicular granite, grunerite, black jade, and mookaite are discussed, as are pearls, fossil wood, and precious metals in jewellery and monumental applications.

Western Australia's 'unique' gemstones

The use of the term 'unique' as applied to this paper is not meant to imply that gemstones described do not occur elsewhere in the world but rather tend to be rare and somewhat unusual in different geological environments around the State.

Accordingly, six rare or somewhat unusual gem and ornamental stones from Western Australia have been selected for this talk. These include: Ellendale diamonds, tourmalite, gaspeite, mookaite, orbicular granite and zebra stone.

Ellendale diamonds

The Ellendale diamond field is located in the Lennard Shelf, about 140 km east-southeast of Derby. This area

contains 50 discrete lamproite intrusions, 38 of which are known to be diamondiferous. About 60% of diamonds recovered from these intrusions are of gem quality but overall grades from most pipes tend to be uneconomic (Fetherston et al., 2013). In 2007, the Ellendale mining operation was acquired by Gem Diamonds Ltd, whose operations centred on the rich Ellendale 9 diamond pipe. The mine is well known internationally as a source of fancy yellow diamonds as it contains the highest proportion of these stones occurring in any known kimberlite or lamproite worldwide (Fig. 1). The strong yellow colouration in the diamonds is due to the presence of nitrogen in the gems' crystal lattice in the range of 100 to 1000 parts per million. Ellendale 9 contributes about 50% of world production of fancy yellow diamonds. Diamonds from Ellendale 9 are sold under a marketing agreement to Laureilton Diamonds Inc. (a subsidiary of Tiffany & Co.) (Western Australian Museum, 2012). In the year ending 30 September 2012, diamond production from Ellendale was almost 156 000 ct. In early December 2012, Gem Diamonds announced that the Ellendale mine was to be sold to Goodrich Resources effective 31 December 2012.



Figure 1. Diamonds from Ellendale showing cushion cut, fancy yellow diamonds (each approximately 1 ct) among Ellendale rough stones (courtesy Kimberley Diamond Company)

Tourmalite

Tourmalite is a tourmaline-rich rock defined as a ‘rock composed almost entirely of tourmaline and quartz, with a mottled appearance and a texture ranging from dense to granular to schistose’. The Warriedar tourmalite deposit is located on an island in the centre of Mongers Lake, about 45 km west-northwest of Paynes Find. Although the presence of tourmaline in the Warriedar area was reported by Simpson (1951), the discovery of tourmalite on the island in Mongers Lake was made in 1962 by a prospector who recognized the lapidary potential of the massive, fine-grained tourmalite. In the early 1990s, mineralogical analysis of specimens was carried out and a system for grading ore samples was devised. Lapidary testing was carried out with carving and polishing of figurines and spheres using different grades of material (Fig. 2). In 2002–03, about 34 t of massive, black, microcrystalline dravite–schorl was extracted for test manufacture of high-quality ornamental jewellery and carved artwork, such as statuettes. The tests demonstrated the material’s extreme hardness, durability, ultra fine grained texture, uniform black colour, and ability to polish to a high lustre. This led to the name ‘Warrierite’ being devised for marketing purposes (Fetherston et al., 1999).



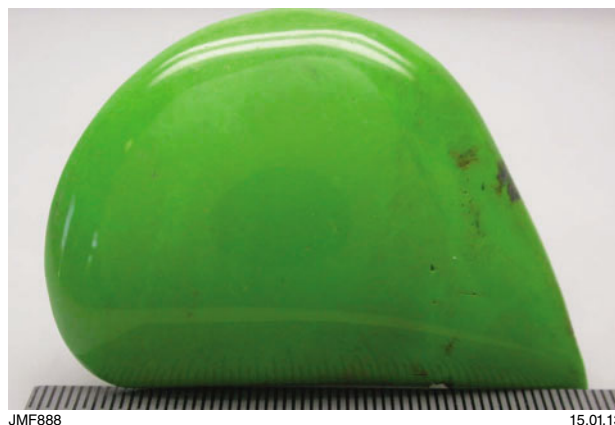
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Figure 2. A highly polished sphere of lapidary-grade warrierite, approximately 13 cm in diameter

Gaspeite

Gaspeite is a green nickel carbonate generally formed by surface or near-surface alteration of nickel sulfides. Gaspeite was named after the Gaspé Peninsula in eastern Canada and was first described in 1966. Gaspeite’s bright apple-green colour and rarity make it a popular gemstone and it is most commonly cut as cabochons or slabbed and polished (Fig. 3). Gaspeite has been recorded from a number of nickel mines in the Eastern Goldfields and the

Pilbara Craton. The best known and main source was the Mount Edwards 132N mine near Widgiemooltha in the Eastern Goldfields (Fetherston et al., 2013).



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Figure 3. A highly polished cabochon of bright apple-green gaspeite

Mookaite

Mookaite is a commercial name for the varicoloured ornamental stone taking its name from the former Mooka Station where it has been quarried since the mid-1960s. It is a popular lapidary material suitable for cutting and polishing and with other desirable qualities, including a wide range of colours. It displays attractive, mottled patterns combined with a very fine grained nature and adequate hardness (Fig. 4). Mookaite is mined from a comparatively small area of Early Cretaceous Windalia Radiolarite at several sites on Mooka Creek, about 32 km northwest of Gascoyne Junction. In this area, mookaite only occurs in specific zones where the effects of surface and near-surface secondary silicification of the radiolarite have resulted in the localized development of cherts or porcellanites. Localized colour mottling and varicolouration of these cherts are the result of blotchy iron staining by later meteoric water activity (Stockmayer and Stockmayer, 2010).



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Figure 4. Tumbled, polished mookaite stones showing a wide range of colours and patterns

Orbicular granite

Orbicular granite, also known as orbicular granodiorite, is a relatively rare orbicular form of granitic rock known only from a few sites around the world, including Western Australia and Scandinavia. In Western Australia, the Boogardie Orbicular granite deposit is located on Boogardie Station, 35 km west of Mount Magnet. The orbicular granite is hosted by a pink, medium-grained, late Archean biotite granodiorite that becomes tonalitic in places. Data from diamond drilling programs suggests that the orbicular granite bodies may have formed as saucer-shaped, sill-like structures within the host rock. Orbicular granite has a very distinctive appearance. It is crowded with black and white, concentrically formed orbicules that are mostly ellipsoidal in shape and composed largely of hornblende and plagioclase feldspar within a lighter coloured matrix of granitic composition. Individual orbicules average 140 mm in diameter, and up to 12 distinct shells have been observed in many of these structures (Fig. 5). The granite is an unusual and attractive igneous rock used as a spectacular lapidary material that is carved into artworks, including sculptures, bookends and coasters as well as cut and polished into spectacular tabletops, and wall and floor tiles (Fetherston, 2010).



Figure 5. A polished tile of Boogardie orbicular granite. The hornblende diorite orbicules are composed largely of white plagioclase feldspar, and large, black, radially aligned hornblende crystals.

Zebra stone

Zebra stone is an attractive, distinctively banded, brown and white, argillaceous, fine-grained siltstone. It is found in the Kununurra region around Lake Argyle in the far north of the State. In this area, it is present in lens-like structures within the upper part of the Neoproterozoic Ranford Formation. Today, a number of known deposits are submerged below the surface of Lake Argyle. Zebra stone generally occurs as regularly spaced, ferruginous, brown bands on a white to pale-brown clay-rich matrix. These bands are commonly arcuate and vary in thickness from 1–25 mm according to the width of individual beds (Fig. 6). Other forms include ovoid-shaped rods and irregular blebs that extend through the rock in

parallel rows. Currently, there are three operating zebra stone openpits (Fetherston et al., 2013). Zebra stone is sufficiently soft to precisely cut and carve using hand tools. The stone has a smooth, silky texture that results in an extremely smooth and semi-gloss finish that is sealed and treated to obtain a satin or gloss finish as required. Zebra stone products include jewellery, bowls, jugs, and many other attractive artefacts.



Figure 6. High-quality zebra stone from Lake Argyle. Bands and rods are approximately 5–6 mm wide.

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