

1980/23. Refractory raw materials in Tasmania

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Abstract

Refractory raw materials in Tasmania are reviewed under the headings of resource status and approximate size. The need for exploration work to confirm hypothetical resources, and for development/research work to upgrade identified resources, is briefly examined.

INTRODUCTION

The Refractories Manufacturers Association of Australia (R.M.A.A.) classifies raw materials used in the manufacture of refractory products as silicates, alumino silicates, magnesite-dolomite-chromite, or miscellaneous.

Due to the lack of adequate data pertaining to refractory raw materials in Tasmania, it is appropriate to use the major components of the United States Bureau of Mines/United States Geological Survey (1976) method of mineral resource classification, namely identified and undiscovered resources.

Identified resources are those specific identified mineral deposits that may or may not be evaluated as to extent and grade, and whose contained minerals may or may not be profitably recoverable with existing technology and economic conditions.

Undiscovered - Hypothetical resources are undiscovered mineral deposits, whether of recoverable or sub-economic grade, that are geologically predictable as existing in known districts.

The category of undiscovered-speculative resources is not considered in this report.

In this report, identified resources are arbitrarily divided into large ($> 10 \times 10^6$ tonnes), and small ($< 10 \times 10^6$ tonnes) groups.

OCCURRENCE OF REFRACTORY RAW MATERIALS IN TASMANIA

SILICATES

Silica

Large identified resources of silica in the form of quartzite and quartz sand occur in Tasmania; the resources of quartzite occur in the north, north-west and west of the State, while the quartz sand resources are known to occur throughout the State. Current production centres are at Beaconsfield, Port Sorell and South Arm.

Talc

Small identified resources of talc occur in the west and north-west of the State, with the only deposit of significance located at Gawler, near Ulverstone.

Hypothetical resources may be predicted in the west of the State, in association with altered dolomitic metasediments (e.g. Savage River).

Zircon

Small identified resources of zircon occur as heavy mineral concentrations in beach sands all around the State, with the largest resources occurring on the east coast. The main locations are:

- (a) West coast - Naracoopa and Cowper Point on King Island, Marrawah, Strahan and Macquarie Harbour;
- (b) South coast - Louisa Bay, Southport Lagoon and Adventure Bay (Bruny Island);
- (c) East coast - Scamander, Chain of Lagoons-Piccaninny Point, Seymour, Friendly Beaches and Seven Mile Beach;
- (d) North coast - Circular Head, Table Cape, Ulverstone, Badger Beach, Beechford (Curries River), Weymouth and Bridport.

Minor identified resources of zircon occur as heavy mineral concentrations in alluvial deposits on Flinders and Cape Barren Islands and in the north-eastern tin fields.

ALUMINO - SILICATES

Andalusite/Sillimanite/Kyanite

Very small identified resources of these minerals occur as heavy mineral concentrations in beach sands around the State at Naracoopa, Southport Lagoon, Chain of Lagoons-Piccaninny Point and Bridport. They are also recorded from the north, north-east and west of the State.

Beryl

Minor occurrences of beryl are known at the Great Republic tin mine in the north-east, from the Moina district and from Mt Bischoff, where all are associated with granite intrusives. These occurrences may warrant classification as hypothetical resources.

Kaolin group clay

Medium to large identified resources of this group (predominantly kaolinite) occur in Tasmania. The most significant deposits occur in the Mawbanna district, at Surges Bay, and in the St Helens-Scottsdale-South Mt Cameron districts. All are due to the alteration of intermediate to acid intrusives. Current production is centred on Tonganah (Scottsdale) where the kaolin is mined for use as a filler clay in paper manufacture.

Pyrophyllite

Small identified resources of pyrophyllite occur in the alteration zones adjacent to the Chester and Pinnacles mines in the west of the State. Because of the close physical similarities of pyrophyllite, talc and sericite, it is very likely that pyrophyllite has not been recognised elsewhere in the west of the State, and for this reason, the hypothetical resources of the mineral may be considerable.

Topaz

Small identified resources of topaz occur as heavy mineral concentrations in beach sand on the north-west (Naracoopa) and east coasts (Scamander, Seymour, Friendly Beaches) of the State, with the largest resources on the east coast. It is also recorded from Flinders Island, Mt Cameron, Bell Mount, Mt Bischoff and Moina in alluvial deposits.

MAGNESITE - DOLOMITE - CHROMITE

Magnesite

Small identified resources of magnesite occur in the west of the State in the Savage and Arthur River areas. Both areas have been recently investigated by mining companies, and work by the CSIRO Division of Mineral Chemistry on the Savage River deposits suggests a viable beneficiation process involving calcination and carbon-dioxide leaching to produce a marketable MgO product.

Hypothetical resources of magnesite similar to the deposits in the Arthur and Savage River areas may be predicted to occur in the zone connecting them (Arthur lineament). Magnesite occurrences are also recorded from the west of the State in association with ultramafic bodies.

Dolomite

Large identified resources of dolomite occur in the north-west, west and south of the State. The most common occurrences are of sedimentary origin and Precambrian age, although small-medium size identified resources of dolomitised Gordon Limestone (Ordovician age) allow the prediction of hypothetical resources of similar dolomite. Production is currently located at Smithton, where it is mined for use for agricultural purposes.

Chromite

Small identified resources of chromite occur as both alluvial and beach sand deposits in Tasmania. Chromite occurs as heavy mineral concentrations in comparatively young beach sands at Marrawah, Strahan, Macquarie Harbour and Rocky Plains Bay, and in older (Tertiary) beach sand near Beaconsfield. Alluvial concentrations of chromite occur in the Smithton, Adamsfield and Sorell Peninsula areas, and in the Styx, Florentine, Huskisson, Harman and Arthur Rivers.

Current production is from the Barnes Hill mine near Beaconsfield, where the chromite occurs in beach sands of paralic marine origin. Although this chromite is marketed as foundry sand, its average composition ($\text{Cr}_2\text{O}_3 \approx 61\%$, $\text{Al}_2\text{O}_3 \approx 10\%$, $\text{Fe}_2\text{O}_3 \approx 19\%$) indicates it may be of use as a refractory material.

Hypothetical resources of additional chromite are predicted in the Beaconsfield area.

MISCELLANEOUS

Bauxite

Small identified resources of bauxite occur at various localities in the north and midlands of the State, but are presently unsatisfactory for use as refractory raw materials due to the high iron content.

Corundum

Very small identified resources of corundum occur in association with other heavy minerals in beach sands at Naracoopa, Strahan and Southport Lagoon. It has also been recorded from the alluvial tin deposits in the north-east of the State, and as poorly exposed outcrops in Bonds Range south-west of Moina. Hypothetical resources of additional corundum may be predicted in the latter area.

Graphite

Small identified resources of graphite occur in the north-west and west of the State, where it has been formed from metamorphosed carbonaceous sediments. Hypothetical resources may be predicted to occur in the same general areas of the State.

Monazite

Small identified resources of monazite occur as heavy mineral concentrations in beach sands all around the State:

- (a) West coast - Naracoopa, Strahan and Macquarie Harbour;
- (b) South coast - Southport Lagoon;
- (c) East coast - Scamander, Chain of Lagoons-Piccaninny Point and Friendly Beaches;
- (d) North coast - Bridport.

Monazite is also recorded in alluvial deposits at Stanley River and Yellowband Plain in the west of the State, and in the alluvial tin deposits of the north-east.

However, as a source of thorium and yttrium, Tasmanian monazites ($\text{ThO}_2 \approx 6\%$, $\text{Y}_2\text{O}_3 \approx 3\%$) may not be as valuable as some mainland monazites.

SUMMARY OF REFRACTORY RAW MATERIALS OCCURRENCE IN TASMANIA

Refractory raw materials in Tasmania may be grouped according to resource status and approximate size, where the latter parameter is of a semi-quantitative nature only, and not rigorously applied.

Identified resources

- (i) Large: kaolin, dolomite, silica.
- (ii) Small: andalusite/sillimanite/kyanite, chromite, corundum, graphite, magnesite, monazite, pyrophyllite, talc, topaz, zircon.

Undiscovered - Hypothetical resources

Beryl, chromite, corundum, dolomite, graphite, kaolin, magnesite, pyrophyllite, silica and talc.

COMMENTS

The 1980 R.M.A.A. report describes five areas of potential development of the refractories industry in Australia, as follows:

- (1) The evaluation of prospective regions.
- (2) Research and development work to enable beneficiation of existing resources to produce marketable refractory products.
- (3) Development of existing resources.
- (4) Production of synthetised refractories.
- (5) Manufacturing.

Most of these areas of potential development are directly applicable to Tasmania, in particular the exploration, development and research categories.

Systematic exploration for the major refractory industry raw materials is necessary to enable an appreciation of the degree of beneficiation (if any) required for the production of marketable products. However, some research investigations would appear necessary in most cases, in view of the specific customer requirements, and the geological factors peculiar to each deposit. An example of such research is found in the CSIRO work on the Savage River magnesite deposits.

Other avenues of research with regard to the beneficiation of clays and bauxite (removal of iron) may allow future utilisation of the Tasmanian deposits of kaolin clay and bauxite.

The process of producing magnesia from seawater and calcium carbide (with the by-product acetylene) should be further investigated, and if warranted Electrona Carbide Industries approached on the subject. Similarly, this company is in a strong position to contemplate the production of silicon carbide in one of the furnaces at Electrona (silicon carbide was produced several years ago by Kemmerton Pty Ltd at Electrona).

Refractory raw materials, similar to other industrial minerals, are appropriately classified as low unit/high place value commodities, a feature which may not suit Tasmania with its isolation from the main user centres on the Australian mainland. However, a compromising feature of Tasmania is its small geographic size, and its availability of seaports in the north, thereby reducing the remote-location-induced special infrastructure problems more commonly experienced in the mainland States.

Finally, it is worth noting that of the four refractory raw materials currently produced in Tasmania (kaolin, dolomite, silica and chromite), none is used by the refractories industry - an aspect which serves to emphasise the lack of development and/or research work.

CONCLUSIONS

- (1) Because of the generally low unit value of industrial minerals, there has been minimal incentive for both individuals and companies to explore for them, with the result that geological/mineralisation knowledge in the State is heavily biased in favour of metallic minerals.
- (2) Tasmania has large identified resources of kaolin, dolomite and silica, and small identified resources of chromite, graphite, magnesite, pyrophyllite, talc, topaz and zircon.

- (3) Tasmania has hypothetical resources of most of the major refractory raw materials; the status of these raw materials as hypothetical is largely a result of the reason given in (1) above.
- (4) For the significant identified and the possibly significant hypothetical resources of refractory raw materials to be fully utilised in Tasmania, the positive factors in favour of such development (low-cost energy, minimal remote-location-induced infrastructure problems etc.) must be supplemented by systematic evaluation of the hypothetical resources of refractory raw materials described previously.

It is suggested that the Tasmania Department of Mines assume responsibility for this work, in conjunction with the recommendations and priorities made by the Tasmania Department of Industrial Development.

REFERENCES

- ANONYMOUS, 1980. Australian refractories industry potential for development. *Unpubl. Draft Rep. Aust. Refractories Industry*
- UNITED STATES BUREAU OF MINES AND UNITED STATES GEOLOGICAL SURVEY, 1976. Mineral resource classification system of the U.S. Bureau of Mines and U.S. Geological Survey. *Bull. U.S. Geol. Surv.* 1450A.

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