
Abstract Based on geochemical signatures of metabasic volcanic rocks, two types of basalt in the Grove Mountains are recognized, namely, oceanic island basalt (OIB) and Mid-oceanic ridge basalt (MORB). Type 1 rocks have similar geochemical characteristics, with high Ti (TiO$_2=2.68\%$), REE (202 mg/g), LREE [(La/Yb)$_{N}=4.8$], Ti/Y (343) and Zr/Ti (3.1), which are similar to those of OIB, and are considered to be products of magma from enriched mantle sources (EM). Type 2 rocks are characterized by low Ti (TiO$_2=1.1\%$-1.31\%), REE (47-93 mg/g), LREE/HREE (2.27-2.54), (La/Yb)$_{N}=1.30$-1.62 and lower P (P$_2$O$_5=0.1\%$-0.2\%) than those of OIB, which are similar to those of MORB. The presence of such rock assemblages suggests the existence of an ocean basin in this region during Pan-African ages.

Keywords OIB, MORB, Grove Mountains, East Antarctica

P588, 124; P595
Fig. 1  Geographical map of the Grove Mountains


1  2

1. 2
## Table 1 Major elements (\%) and trace elements (\mu g/g) contents of metabasic volcanic rocks from Grove Mountains

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### Notes

- La, Ce, Pr, Nd, Sm, Eu, Gd, Ho, Er, Tm, and Yb are major elements.
- SiO₂, TiO₂, Al₂O₃, FeO, and MgO are major oxides.
- La, Ce, Pr, Nd, Sm, Eu, Gd, Ho, Er, Tm, and Yb are rare earth elements.
- Rare earth element (REE) concentrations are given as relative to chondritic values.

### References

- Anders and Grevesse (1989)
- Sun and McDonough (1989)

### Original Data

- All data are from the authors' analysis and are presented in the original units of measurement.
在变质作用过程中为易迁移元素，表现为围绕在石榴石周围的成冠状体的斜长石及斜方辉石。

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### 2.3

变基性火山岩的原岩类型

在变质作用过程中为易迁移元素，表现为围绕在石榴石周围的成冠状体的斜长石及斜方辉石。

### 2.4

### 2.1

### 2.2

### 2.3

变基性火山岩的原岩类型

在变质作用过程中为易迁移元素，表现为围绕在石榴石周围的成冠状体的斜长石及斜方辉石。

### 2.4

变基性火山岩的原岩类型

在变质作用过程中为易迁移元素，表现为围绕在石榴石周围的成冠状体的斜长石及斜方辉石。

### 2.5

变基性火山岩的原岩类型

在变质作用过程中为易迁移元素，表现为围绕在石榴石周围的成冠状体的斜长石及斜方辉石。
Fig. 3 Zr/TiO$_2$ vs. SiO$_2$, Zr/TiO$_2$ vs. Nb/Y (after Winchester and Floyd, 1977) and AFM (after Irvine and Baragar, 1971) classification diagrams for metabasic volcanic rocks.

3 Nb-Ta MORB OIB 10−20 (Weaver, 1991a).

Ba/Ce 1.1−0.6 (Halliday, 1995), Ti/Y (3.4−3.1).

MORB LIL (Sr, Ba) MORB (OIB) (Th, HFS, REE) MORB.

• MORB (OIB) (Th, HFS, REE) MORB

3 }
4. REE diagrams

Fig. 4 Chondrite-normalized REE diagrams

5. MORB-normalized incompatible element spidergrams

Fig. 5 MORB-normalized incompatible element spidergrams

6. Tectonic discriminant diagrams for metabasic volcanic rocks

Fig. 6 Tectonic discriminant diagrams for metabasic volcanic rocks
由于玄武岩中微量元素含量与其所形成的构造环境密切相关，因此可以根据玄武岩中各种微量元素的含量特征来判断玄武岩的形成环境。这也是目前在判断岩石成因及形成环境时最常用和最有效的方法。

在利用微量元素进行板块构造环境判别的同时，我们也强调使用主量元素进行环境判别。

图解中两类样品基本上分别落入（67和62）范围内。这些是蚀变和变质作用过程中十分稳定的不活动微量元素。而火山岩中丰度与火山岩源区物质组成及火山岩的形成环境有十分密切的关系，因此根据比值特征及图解也可以判别本区变质性火山岩的来源。洋岛型变基性火山岩落入（87和82）区，而板内叠加区（87）型变基性火山岩基本落入（87）区。尽管在岩浆中微量元素的丰度和比值存在相当的变化，但是与喷发于会聚和离散板块边缘的玄武岩而言，它们仍然是有特征的，而且经常是强烈的富集不相容微量元素。

端元组分的影响表明它们来源于富集地幔源区，明显不同于来源于亏损地幔源区的。

表列出了本区变质性火山岩的不相容元素比值的平均值，并与地幔端元值进行了比较。大多数比值与富集地幔源区较一致。

沉积物的俯冲对一些U+型的地球化学留下了重要的印记，如VJ的比值就是沉积物俯冲的结果。本区（67）型变质性火山岩的不是典型的富集和，可能与俯冲重循环的地壳的混染有关。

表格罗夫山（67）型变质性火山岩微量元素与地幔端元组分的差异各参数值引自（J1）。

致谢感谢国家海洋局极地办公室对本工作的支持。向李继亮研究员、张旗研究员、王凯怡研究员及杨进辉博士深表谢意。

Table 2 The difference between mantle end-member compositions and trace elements of OIB-type metabasic volcanic rocks from Grove Mountains

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