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Canadian Certified Reference Materials Project



PCMRC

Projet canadien de matériaux de référence certifiés

# Certificate of Analysis

June 1995

## SY-4

### Diorite Gneiss Reference Material Certified Values $\pm$ 95% Confidence Interval

|                                      |       |            |   |                               |       |             |   |
|--------------------------------------|-------|------------|---|-------------------------------|-------|-------------|---|
| Al <sub>2</sub> O <sub>3</sub>       | 20.69 | $\pm$ 0.08 | % | MnO                           | 0.108 | $\pm$ 0.001 | % |
| CaO                                  | 8.05  | $\pm$ 0.04 | % | Na <sub>2</sub> O             | 7.10  | $\pm$ 0.05  | % |
| CO <sub>2</sub>                      | 3.5   | $\pm$ 0.1  | % | P <sub>2</sub> O <sub>5</sub> | 0.131 | $\pm$ 0.004 | % |
| Fe <sub>2</sub> O <sub>3</sub> total | 6.21  | $\pm$ 0.03 | % | SiO <sub>2</sub>              | 49.9  | $\pm$ 0.1   | % |
| FeO                                  | 2.86  | $\pm$ 0.09 | % | TiO <sub>2</sub>              | 0.287 | $\pm$ 0.003 | % |
| K <sub>2</sub> O                     | 1.66  | $\pm$ 0.02 | % | LOI                           | 4.56  | $\pm$ 0.07  | % |
| MgO                                  | 0.54  | $\pm$ 0.01 | % |                               |       |             |   |

|    |      |            |           |    |      |           |           |
|----|------|------------|-----------|----|------|-----------|-----------|
| Ba | 340  | $\pm$ 5    | $\mu$ g/g | Nd | 57   | $\pm$ 1   | $\mu$ g/g |
| Be | 2.6  | $\pm$ 0.1  | $\mu$ g/g | Ni | 9    | $\pm$ 1   | $\mu$ g/g |
| Ce | 122  | $\pm$ 2    | $\mu$ g/g | Pb | 10   | $\pm$ 1   | $\mu$ g/g |
| Co | 2.8  | $\pm$ 0.2  | $\mu$ g/g | Pr | 15.0 | $\pm$ 0.3 | $\mu$ g/g |
| Cr | 12   | $\pm$ 1    | $\mu$ g/g | Rb | 55   | $\pm$ 1.5 | $\mu$ g/g |
| Cs | 1.5  | $\pm$ 0.1  | $\mu$ g/g | Sc | 1.1  | $\pm$ 0.1 | $\mu$ g/g |
| Cu | 7    | $\pm$ 1    | $\mu$ g/g | Sm | 12.7 | $\pm$ 0.4 | $\mu$ g/g |
| Dy | 18.2 | $\pm$ 0.6  | $\mu$ g/g | Sr | 1191 | $\pm$ 12  | $\mu$ g/g |
| Er | 14.2 | $\pm$ 0.5  | $\mu$ g/g | Ta | 0.9  | $\pm$ 0.1 | $\mu$ g/g |
| Eu | 2.00 | $\pm$ 0.04 | $\mu$ g/g | Tb | 2.6  | $\pm$ 0.1 | $\mu$ g/g |
| Ga | 35   | $\pm$ 1    | $\mu$ g/g | Th | 1.4  | $\pm$ 0.2 | $\mu$ g/g |
| Gd | 14.0 | $\pm$ 0.5  | $\mu$ g/g | Tm | 2.3  | $\pm$ 0.1 | $\mu$ g/g |
| Hf | 10.6 | $\pm$ 0.4  | $\mu$ g/g | U  | 0.8  | $\pm$ 0.1 | $\mu$ g/g |
| Ho | 4.3  | $\pm$ 0.1  | $\mu$ g/g | V  | 8    | $\pm$ 1.6 | $\mu$ g/g |
| La | 58   | $\pm$ 1    | $\mu$ g/g | Y  | 119  | $\pm$ 2   | $\mu$ g/g |
| Li | 37   | $\pm$ 2    | $\mu$ g/g | Yb | 14.8 | $\pm$ 0.4 | $\mu$ g/g |
| Lu | 2.1  | $\pm$ 0.1  | $\mu$ g/g | Zn | 93   | $\pm$ 2   | $\mu$ g/g |
| Nb | 13   | $\pm$ 1    | $\mu$ g/g | Zr | 517  | $\pm$ 16  | $\mu$ g/g |

## DESCRIPTION

SY-4 is a diorite gneiss obtained from an outcrop of the Rosenthal-Reid Lake Belt in Brudenell Township, Renfrew County, Ontario, Canada. It is intended as a replacement for the popular rock reference material, SY-2, which is now depleted.

Over 350 kg of rock was collected. This was dried, cleaned, broken, crushed and ground to  $-74 \mu\text{m}$  ( $-200$  mesh). The powdered material was blended and bottled in 100-g lots. The analyses for homogeneity assessment were performed by the Geological Survey of Canada (GSC). This involved a complete whole-rock analysis along with barium, strontium, rubidium and zirconium on 22 bottles chosen according to a stratified random sampling scheme. The analysis was done in duplicate using a fused-disk X-ray fluorescence technique.

Mineralogical investigation of SY-4 revealed major amounts of oligoclase and scapolite and minor amounts of biotite, calcite and analcime along with trace amounts of magnetite and apatite.

## CERTIFICATION

Eighty-nine university, commercial, and government laboratories from all over the world participated in an interlaboratory certification program. Up to 80 elements were analyzed by methods of each laboratory's

choice. A statistical analysis of the data yielded recommended values for 49 constituents and provisional values for 8 more.

## LEGAL NOTICE

The Canadian Certified Reference Materials Project has prepared this reference material and statistically evaluated the analytical data of the inter-laboratory certification program to the best of its ability. The purchaser, by receipt hereof, releases and indemnifies the Canadian Certified Reference Materials Project from and against all liability and costs arising out of the use of this material and information.

## REFERENCE

The preparation and certification procedures used for SY-4 will be published. Copies of this report will be made available free of charge on application to:

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## Provisional Values $\pm$ 95% Confidence Interval

|                   |                 |                 |                    |                   |                 |
|-------------------|-----------------|-----------------|--------------------|-------------------|-----------------|
| C                 | 1.0 $\pm$ 0.1   | %               | H <sub>2</sub> O-  | 0.15 $\pm$ 0.05   | %               |
| F                 | 0.06 $\pm$ 0.01 | %               | S <sup>total</sup> | 0.015 $\pm$ 0.004 | %               |
| H <sub>2</sub> O+ | 1.0 $\pm$ 0.3   | %               |                    |                   |                 |
| Ag                | 0.6 $\pm$ 0.16  | $\mu\text{g/g}$ | Sn                 | 7.1 $\pm$ 0.6     | $\mu\text{g/g}$ |
| Br                | 217 $\pm$ 14    | $\mu\text{g/g}$ |                    |                   |                 |

## Information Values (Range)

|    |            |                 |                 |             |                 |
|----|------------|-----------------|-----------------|-------------|-----------------|
| Cl | 0.3 - 0.6  | %               | SO <sub>3</sub> | 0.01 - 0.08 | %               |
| As | 0.1 - 2    | $\mu\text{g/g}$ | Mo              | 0.2 - 3     | $\mu\text{g/g}$ |
| B  | 13 - 18    | $\mu\text{g/g}$ | Sb              | 0.01 - 0.3  | $\mu\text{g/g}$ |
| Bi | 0.1 - 0.3  | $\mu\text{g/g}$ | Se              | 0.01 - 4    | $\mu\text{g/g}$ |
| Cd | 0.1 - 2    | $\mu\text{g/g}$ | Tl              | 0.2 - 0.5   | $\mu\text{g/g}$ |
| Ge | 1 - 4      | $\mu\text{g/g}$ | W               | 0.2 - 15    | $\mu\text{g/g}$ |
| Hg | 10 - 14    | ng/g*           |                 |             |                 |
| In | 0.04 - 0.1 | $\mu\text{g/g}$ |                 |             |                 |

\* ng/g =  $10^{-9}$  g/g (i.e., ppb)

Pour obtenir la version française du présent certificat d'analyse, prière de s'adresser au Coordinateur du PCMR.