



**United States Geological Survey**  
**Certificate of Analysis**

**Granodiorite, Silver Plume, Colorado, GSP-2**

Material used in the preparation of GSP-2 was collected by the U.S. Geological Survey, from the Silver Plume Quarry, which is located approximately 800 meters west of Silver Plume, Colorado. This is same location used to provide material for GSP-1. GSP-2 is a medium grained hypidiomorphic-granular rock consisting essentially of quartz, plagioclase, microcline, biotite, and muscovite. Details of the collection, preparation, and testing are available (Wilson, S.A., 1998).

Element concentrations were determined in a round robin study involving 20 international laboratories. Recommended values are listed when analytical results provided by three independent laboratories using a minimum of three independent analytical procedures are in statistical agreement. Information values with standard deviations are listed when at least four independent laboratories using two independent analytical procedures have provided information. Information values without standard deviations represent information from a single laboratory or analytical procedure.

**Recommended values**

| Element           | Wt % | ±    | Oxide                              | Wt % | ±    |
|-------------------|------|------|------------------------------------|------|------|
| Al                | 7.88 | 0.11 | Al <sub>2</sub> O <sub>3</sub>     | 14.9 | 0.2  |
| Ca                | 1.50 | 0.04 | CaO                                | 2.10 | 0.06 |
| Fe <sub>tot</sub> | 3.43 | 0.11 | Fe <sub>2</sub> O <sub>3 tot</sub> | 4.90 | 0.16 |
| K                 | 4.48 | 0.12 | K <sub>2</sub> O                   | 5.38 | 0.14 |
| Mg                | 0.58 | 0.02 | MgO                                | 0.96 | 0.03 |
| Na                | 2.06 | 0.07 | Na <sub>2</sub> O                  | 2.78 | 0.09 |
| P                 | 0.13 | 0.01 | P <sub>2</sub> O <sub>5</sub>      | 0.29 | 0.02 |
| Si                | 31.1 | 0.4  | SiO <sub>2</sub>                   | 66.6 | 0.8  |
| Ti                | 0.40 | 0.01 | TiO <sub>2</sub>                   | 0.66 | 0.02 |

| Element | µg/g | ±   | Element | µg/g | ±    |
|---------|------|-----|---------|------|------|
| Ba      | 1340 | 44  | Pb      | 42   | 3    |
| Ce      | 410  | 30  | Rb      | 245  | 7    |
| Co      | 7.3  | 0.8 | Sc      | 6.3  | 0.7  |
| Cr      | 20   | 6   | Sm      | 27   | 1    |
| Cu      | 43   | 4   | Sr      | 240  | 10   |
| Eu      | 2.3  | 0.1 | Th      | 105  | 8    |
| Ga      | 22   | 2   | U       | 2.40 | 0.19 |
| La      | 180  | 12  | V       | 52   | 4    |
| Mn      | 320  | 20  | Y       | 28   | 2    |
| Nb      | 27   | 2   | Yb      | 1.6  | 0.2  |
| Nd      | 200  | 12  | Zn      | 120  | 10   |
| Ni      | 17   | 2   | Zr      | 550  | 30   |

### Information values

| Element | $\mu\text{g/g}$ | $\pm$ | Element | $\mu\text{g/g}$ | $\pm$ |
|---------|-----------------|-------|---------|-----------------|-------|
| Be      | 1.5             | 0.2   | Ho      | 1.0             | 0.1   |
| Cs      | 1.2             | 0.1   | Li      | 36              | 1     |
| Dy      | 6.1             |       | Lu      | 0.23            | 0.03  |
| Er      | 2.2             |       | Mo      | 2.1             | 0.6   |
| F       | 3000            |       | Pr      | 51              | 5     |
| Gd      | 12              | 2     | Tl      | 1.1             |       |
| Hf      | 14              | 1     | Tm      | 0.29            | 0.02  |

### Bibliography

Wilson, S.A., 1998, Data compilation for USGS reference material GSP-2, Granodiorite, Silver Plume, Colorado, U.S. Geological Survey Open-File Report (in progress).

### Glossary

|                 |   |
|-----------------|---|
| Wt %            | Weight percent of element/oxide as received           |
| $\mu\text{g/g}$ | Micrograms of element per gram of sample, as received |
| $\pm$           | One standard deviation                                |

Denver, Colorado      Dr. Linda Gunderson  
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U.S. Geological Survey  
Central Region Mineral Team

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USGS reference materials (RMs) may be obtained directly from Dr. Stephen A. Wilson at the address or numbers listed below. The price for each bottle of RM is \$65.00 (U.S.) **except** DGPM-1 which is \$150.00 (U.S.). This cost includes all shipping and handling charges using normal mail delivery. Urgent requests for RMs should be initiated by FAX or e-mail. If required, overnight delivery is available with these charges added to the final bill.

Dr. Stephen A. Wilson  
U.S. Geological Survey  
Box 25046, MS 973  
Denver, CO 80225

Tel: 303-236-2454  
FAX: 303-236-3200 or 303-236-1425  
e-mail: [swilson@usgs.gov](mailto:swilson@usgs.gov)

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