

Table 6.4

## a) Steady state flow properties for selected rocks and minerals

| Rock/Mineral            | Exponent<br>$n$ | $A_p$<br>( $\text{Pa}^{-n} \text{s}^{-1}$ ) | $Q_p$<br>( $\text{kJ mol}^{-1}$ ) | Primary Reference          |
|-------------------------|-----------------|---|-----------------------------------|----------------------------|
| Quartz                  | 3.0             | $1.2 \times 10^{-24}$                       | 92                                | Heard and Carter (1968)    |
| Quartzite (dry)         | 3.0             | $6.1 \times 10^{-24}$                       | 190                               | Brace and Kohlstedt (1980) |
| Quartzite (wet)         | 1.9             | $1.2 \times 10^{-13}$                       | 173                               | Hansen (1982)              |
| Granite (Westerly: wet) | 1.9             | $7.9 \times 10^{-16}$                       | 141                               | Hansen and Carter (1983)   |
| Granite (Westerly: dry) | 3.3             | $3.1 \times 10^{-26}$                       | 186                               | Hansen and Carter (1983)   |
| Anorthosite             | 3.2             | $3.2 \times 10^{-22}$                       | 238                               | Shelton and Tullis (1981)  |
| Diabase (dry)           | 3.05            | $3.1 \times 10^{-20}$                       | 276                               | Caristan (1982)            |
| Diabase (Columbia)      | 4.7             | $1.1 \times 10^{-26}$                       | 488                               | Mackwell et al. (1998)     |
| Diabase (Maryland)      | 4.7             | $5.0 \times 10^{-28}$                       | 482                               | Mackwell et al. (1998)     |
| Quartz Diorite          | 2.4             | $1.2 \times 10^{-16}$                       | 212                               | Hansen (1982)              |
| Orthopyroxene (wet)     | 2.8             | $1.0 \times 10^{-19}$                       | 271                               | Rayleigh et al. (1971)     |
| Orthopyroxene (dry)     | 2.4             | $1.2 \times 10^{-15}$                       | 293                               | Ross and Nielsen (1978)    |
| Clinopyroxene (wet)     | 3.3             | $2.3 \times 10^{-14}$                       | 490                               | Boland and Tullis (1986)   |
| Clinopyroxene (dry)     | 5.3             | $1.6 \times 10^{-36}$                       | 380                               | Boland and Tullis (1986)   |
| Olivine                 | 3.0             | $7.0 \times 10^{-14}$                       | 520                               | Goetze (1978)              |
| Olivine (dry)           | 3.5             | $2.4 \times 10^{-16}$                       | 540                               | Karato et al. (1986)       |
| Olivine (wet)           | 3.0             | $1.9 \times 10^{-15}$                       | 420                               | Karato et al. (1986)       |
| Dunite(wet)             | 4.5             | $4.0 \times 10^{-25}$                       | 498                               | Chopra and Paterson (1981) |
| Dunite(dry)             | 3.6             | $7.9 \times 10^{-18}$                       | 535                               | Chopra and Paterson (1981) |

## b) Selected parameters for low-temperature plasticity laws (LPT) at lithospheric conditions

| LTP flow law             | Exponent<br>$n$ | $A$<br>( $\text{MPa}^{-n} \text{s}^{-1}$ ) | $Ho$ | sigma | $p$ | $q$ |
|--------------------------|-----------------|--|------|-------|-----|-----|
| Goetze (1978)            | 0               | $5.7 \times 10^{11}$                       | 536  | 8.5   | 1   | 2   |
| Evans & Goetze (1979)    | 0               | $1.4 \times 10^{12}$                       | 499  | 9.1   | 1   | 2   |
| Raterron et al. (2004)   | 0               | $2.6 \times 10^{12}$                       | 564  | 15.4  | 2/3 | 2   |
| Katayama & Karato (2008) | 2               | $1.0 \times 10^{7.8}$                      | 320  | 2.87  | 1   | 2   |
| Mei et al. (2010)        | 2               | $1.4 \times 10^{12}$                       | 320  | 5.9   | 1/2 | 1   |

## c) Selected parameters for power law creep (PLC) at lithospheric conditions

| PCL flow law                   | Exponent<br>$n$ | $B$<br>( $\text{s}^{-1} \text{MPa}^{-n}$ ) | $E^*$<br>( $\text{kJ mol}^{-1}$ ) | $V^*$<br>( $10^{-6} \text{m}^3 \text{mol}^{-1}$ ) |
|--------------------------------|-----------------|--|-----------------------------------|---|
| Hirth & Kohlstedt (2003) - dry | 3.5             | $1.10 \times 10^5$                         | 530                               | 14  |
| Hirth & Kohlstedt (2003) - wet | 3.5             | $3.58 \times 10^5$                         | 480                               | 11  |