# ISOTOPE RESULTS OF FINNISH BEDROCK

Contains elements:
1) Published age determinations
2) Published Sm-Nd isotope data
~~3) Published Pb-Pb isotope data (not yet ready)~~
~~4) Published C-isotope data (on carbonates) (not yet ready)~~

This product contains published isotope results from Finland, which comprise predominantly U-Pb zircon data produced at the Geological Survey of Finland since 1964. The information given in the "Published age determinations" section consists of location data, rock type, minerals analysed, method, age data, references and comments. The "Published Sm-Nd isotope data" gives data in standard format, predominantly produced at GTK since 1981.

## PUBLISHED AGE DETERMINATIONS – EXPLANATIONS

The register is based on published age determinations, which comprise predominantly U-Pb zircon data produced at the Geological Survey of Finland since 1964. The information given consists of location data, rock type, mineral analysed, method, age data, references and comments.

Minerals:

| | |
|---|---|
| AP | apatite |
| BAD | baddeleyite |
| BT | biotite |
| CB | columbite |
| DA | davidite |
| PHL | phlogopite |
| FLU | fluorite |
| GRT | garnet |
| HBL | hornblende |
| KF | K-feldspar |
| MU | muscovite |
| MZ | monazite |
| PLAG | plagioclase |
| PX | pyroxene |
| CPX | clinopyroxene |
| OPX | orthopyroxene |
| TI | titanite |
| UR | uraninite |
| WR | whole rock |
| XEN | xenotime |
| ZR | zircon |

Method:
TIMS: thermal ionisation mass spectrometry, TIMS-CA= chemical abrasion pre-treatment (Mattinson, 2005)
SIMS: secondary ion mass spectrometry (mostly NORDSIM)
ICPMS: LA-MC-ICPMS = laser ablation multi collector inductively coupled mass spectrometry

The main age data contains six elements:
Age: For igneous rocks the age (Ma) given is mostly interpreted as primary age.
Error_2s: ±2s, error estimate on the 2-sigma level,
L-int: lower concordia intercept age for U-Pb (Ma),
Li-err: error in lower intercept age
N: number of analyses, N(NN) = N used for age calculation of total NN
R: reliability of age: I =Age based on isochron/chord, for U-Pb denotes upper intercept age, C= concordant U-Pb, NC= nearly concordant U-Pb, R= reference line for U-Pb (large MSWD, discordant data etc.)

The secondary age data contains three elements, for example:
Mineral2: mineral - method: MZ – U-Pb, TI – U-Pb, GRT – Sm-Nd, see mineral list above
Age2: U-Pb age on MZ & TI; Sm-Nd age of GRT - whole rock
Error2_2s: ±2s2, error estimate on the 2-sigma level

The comments contain additional information such as age results from e.g. titanite and monazite, eventual Nd epsilon values etc. The abbreviations include: sl (=slightly), disc (=discordant), conc (=concordant), E-Nd (=initial epsilon Nd), heter (=heterogeneous), excl (=excluded), frac (=fraction), 7/6 (= $^{207}Pb/^{206}Pb$ age).

Column "Publ":
j: result and data have been published
j&: result has been updated using unpublished data obtained after publication
m: age given, but no isotope data are published
a: age given in abstract, but no isotope data are published

## PUBLISHED Sm-Nd ISOTOPE RESULTS - EXPLANATIONS

The "Published Sm-Nd isotope data" gives data in standard format, predominantly produced at GTK since 1981. For details, see Huhma et al 2012b.
-The $^{143}Nd/^{144}Nd$ ratios are normalized to $^{146}Nd/^{144}Nd=0.7219$, error is 2 standard error of mean.
-The $\varepsilon_{Nd}(T)$ is calculated using $\lambda^{147}Sm=6.54 \cdot 10^{-12}$ $a^{-1}$, $^{147}Sm/^{144}Nd=0.1966$ and $^{143}Nd/^{144}Nd=0.512640$ for the present CHUR. $T_{DM}$ was calculated after DePaolo (1981). The age (T) used in calculation is based on isotope dating (mostly U-Pb zircon) or estimated from the rock association.
Domain is the geographic/geotectonic area of the sample: Sv= Svecofennian (SvA, SvB and SvC according to Korsman etal 1997), K= Karelian (KKa= Kainuu, KPK= P-Karjala, KPP= Peräpohja, KLappi=Lapland, Lgrl= Lapland granulite belt). For Archean rocks the geographic areas used are: Pudasjärvi, Suomussalmi, Kuhmo, Ilomantsi, P-Karjala, Lapland, Koillismaa, Kainuu, Iisalmi.

Sort column gives AR for Archean and PR for Proterozoic, with further sorting using GRA=granitoids, FEL= felsic volcanics, MAV=mafic volcanics, MAF=mafic rocks, SED=sedimentary rocks.

In addition to the published results, a lot of unpublished isotope data are available at GTK.

For further information contact:

Dr. Hannu Huhma, Geological Survey of Finland
hannu.huhma@gtk.fi
P.O. Box 96, FI-02151 Espoo, Finland