

Database on Naturally Occurring Radioactive Material

OK. Iwaoka, N. Kuroda, T. Shimomura, H. Tabe and H. Yonehara
National Institute of Radiological Sciences;
4-9-1 Anagawa, Inage, Chiba, 263-8555, Japan

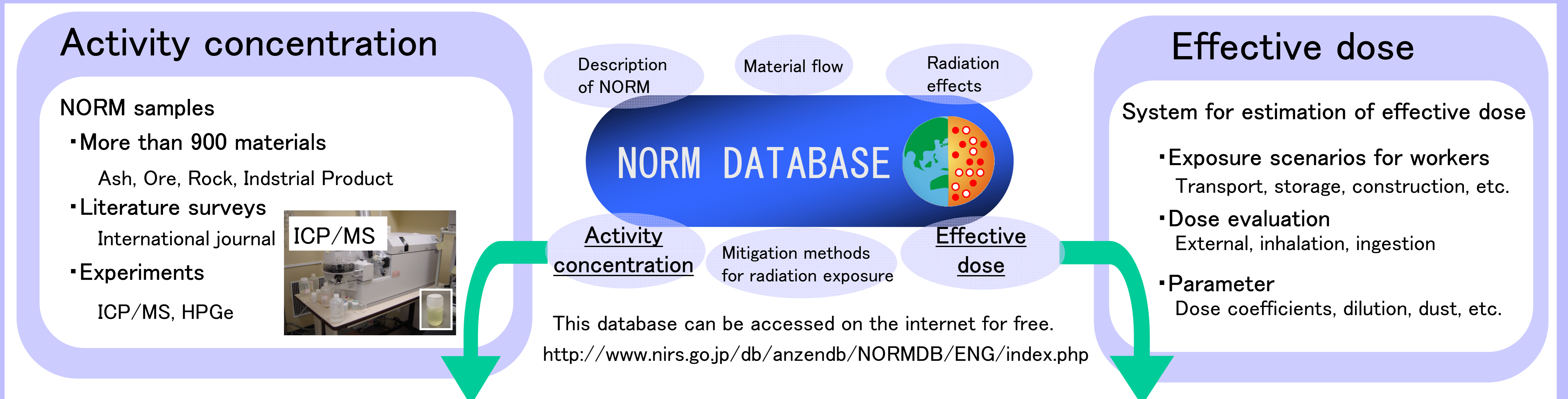


E-mail: iwaoka@nirs.go.jp

Abstract

We collected NORM samples, and measured the activity concentration in them using ICP-MS (inductively-coupled plasma mass spectrometry) and gamma ray spectrometry. Furthermore, we developed a database of activity concentration in NORMs using their results as well as investigation in literatures, and published the database on the web. (NORM database; <http://www.nirs.go.jp/db/anzendb/NORMDB/ENG/index.php>). The purpose of the database is to dispel anxieties among the general public and to provide extensive data regarding NORM to researchers and regulators. The database is providing the activity concentration in more than 900 NORMs at no fee. The database is freely available to the web.

1. NORM DATABASE



2. Activity concentration

Users can see the activity concentration in more than 900 materials such as rock, industrial product by using a search system.

Data Input

Ore data Search Clear Display item

Class name Country State of the material Method of measurement Supplementary information

Name of materials Local origin

Users input the name of material & its location, and get the activity concentration.

Result

| # | Class name | Material name State of the material | Country/Location Region | Method of measurement Supplementary information | Type of representative value Sample | Radioactivity concentration ¹⁾ | | | | |
|----|---------------|-------------------------------------|---------------------------------|---|-------------------------------------|---|----------------|----------------|----------------|--------------|
| | | | | | | U-238 (Bq/kg) | Ra-226 (Bq/kg) | Th-232 (Bq/kg) | Ra-228 (Bq/kg) | K-40 (Bq/kg) |
| 21 | Phosphate ore | phosphate rock (phosphate deposit) | GREECE vevora | ICP/MS, NAA, and XRF | single | 59 | 182 | 347 | 529 | 614 |
| 22 | Phosphate ore | apatite gran | USA Durango | ICP/MS | single | 182 | 347 | 529 | 614 | 37 |
| 23 | Phosphate ore | apatite gran | AUSTRAL Mount Dromedary | ICP/MS | single | 347 | 529 | 614 | 37 | 19 |
| 24 | Phosphate ore | phosphate ore | EGYPT Abu-Zabal phosphate plant | gamma-ray spectrometry | single | 529 | 614 | 37 | 19 | |

Country of origin Method of measurement Activity concentration of ^{238}U , ^{226}Ra , ^{232}Th , ^{228}Ra , ^{40}K

Some data of activity concentration in more than 900 materials

| Material | Annual amount of import in Japan | Nuclide | Amount data | Activity concentration (Bq/kg) | | |
|---------------|----------------------------------|---------------|-------------|--------------------------------|---------|---------|
| | | | | Ave. | Min. | Max. |
| Zr ore | 78020 ton | U-238 series | 45 | 4.7E+03 | 1.8E+03 | 1.3E+04 |
| | | Th-232 series | 41 | 2.1E+03 | 3.6E+02 | 4.3E+04 |
| | | K-40 | 33 | 1.2E+02 | 0.0E+00 | 1.3E+03 |
| Ti ore | 509797 ton | U-238 series | 26 | 1.8E+02 | 5.4E+00 | 6.4E+02 |
| | | Th-232 series | 30 | 1.9E+02 | 5.2E+00 | 5.7E+02 |
| | | K-40 | 11 | 7.7E+01 | 1.0E+01 | 3.3E+02 |
| Granite | 44696 ton | U-238 series | 194 | 5.7E+01 | 1.0E+00 | 5.8E+02 |
| | | Th-232 series | 183 | 9.5E+01 | 1.0E+00 | 9.1E+02 |
| | | K-40 | 181 | 1.1E+03 | 4.5E+01 | 2.0E+03 |
| Coal Ash | - | U-238 series | 25 | 2.9E+02 | 4.5E+01 | 2.1E+03 |
| | | Th-232 series | 14 | 9.0E+01 | 3.9E+01 | 1.7E+02 |
| | | K-40 | 14 | 3.4E+02 | 8.8E+01 | 7.3E+02 |
| P Fertilizer | 166634 ton | U-238 series | 74 | 5.9E+02 | 2.0E+00 | 7.0E+03 |
| | | Th-232 series | 63 | 1.5E+02 | 2.9E+00 | 6.5E+02 |
| | | K-40 | 21 | 4.9E+02 | 3.0E+00 | 4.0E+03 |
| Sludge of Oil | - | U-238 series | 33 | 1.7E+04 | 0.0E+00 | 1.2E+05 |
| | | Th-232 series | 14 | 7.1E+03 | 1.4E+01 | 4.1E+04 |
| | | K-40 | 14 | 2.1E+03 | 4.3E+00 | 2.2E+04 |

- The classification of materials was performed using HS (harmonized system) code defined by the WCO (World Customs Organization).
- Annual amount of import in Japan was obtained from foreign trade statistics of MOF (Minister of Finance) of Japan.
- It is assumed that U-238 series nuclides were in radioactive equilibrium and their activities are equal. The same is true for the Th-232 series.
- The average value of activity concentration is arithmetic average.

3. Effective dose

Users can obtain the effective dose to workers handling NORM by using a dose assessment system.

Data Input

Choose the type of material

Type of material: Natural resources (ore, rock, coal, etc.)

Choose the name of material

Name of material: Zirconium ore

Choose the usage condition

Usage condition: Indoor storage without processing procedures

Choose the annual work hour

Annual work hours: 1800hours (35 hours per 1 week)

Dose calculation

Users input just four items, "Type of material", "Name of material", "Usage condition", & "Annual work hours", and get the effective dose.

Result

Annual dose: 0.98 mSv

The dose presented here is a calculated result under typical conditions, and does not represent actual dose.

Annual Effective dose

Comparison of "calculated dose" and "dose in daily life"

Calculated dose: 0.98 mSv

Dose in daily life: 100mSv, 10mSv, 1mSv, 0.1mSv, 0.01mSv

Models for dose assessments described in Radiation Protection 122 (RP 122) published by the European Commission are used for the system.

RP 122 (Practical Use of the Concepts of Clearance and Exemption-Part; Application of the Concepts of Exemption and Clearance to Natural Radiation Sources: Radiation Protection 122, European Commission(2001))

Please try the NORM DATABASE
<http://www.nirs.go.jp/db/anzendb/NORMDB/ENG/index.php>
Free of charge, and No registration