SORPTION DATA BASE FOR PERFORMANCE ASSESSMENT OF RADWASTE REPOSITORY

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Abstract

Sorption data base (SDB) provides readily available data for the performance assessment of radwaste repository when site–specific data are not available and/or more reference data are needed [1]. The software developed in the Korea Atomic Energy Research Institute (KAERI), SDB-21C, is a graphic user interface (GUI) program that provides efficient and user friendly tools for evaluating the large amount of sorption data. The data base of distribution coefficients compiled in the program contains about 11,000 Nuclear Energy Agency (NEA) data and 2,000 KAERI data up to now while the addition of new data is under progress. Furthermore, the parametric model and its compiled data sets are also included in SDB-21C.

1. INTRODUCTION

The NEA Sorption Data Base (SDB) was made to provide comprehensive and complete sorption data for the performance assessment of radwaste repository [2]. It was designed to run on a micro-computer operated in the OS system of MS DOS using the dBASE III plus, and mathematical manipulation of the data and graphic representations can be performed with different software such as Lotus 123 separately. Though the NEA SDB provides the most comprehensive source of both published and unpublished data for radionuclide sorption measurements, the use of the SDB has been limited because of the complexity of the manipulation. In addition, the SDB has been no longer up to date from 1991. As a result, the demand for the modification of the NEA SDB and an update of the sorption data has been suggested by the users and researchers.

SDB-21C was developed not only to provide a user-friendly tool for the evaluation of sorption data but also to compile the sorption data produced in KAERI during the last ten years. Unlike the NEA SDB, SDB-21C provides the functions of adding, searching, graphic representing and analyzing sorption data in an integrated manner, and also contains the parametric model and its three dimensional representation.

The application of the program can be summarized as follows:

- Determination of a single distribution coefficient value in the specific conditions of interest,
- Determination of the range of distribution coefficient when the specific data are not available,
- Estimation of overall trend of sorption as a function of experimental condition using severalgraphic representations,
- Prediction of sorption behavior by the parametric model.

2. DEVELOPMENT OF SDB-21C

SDB-21C was developed to be run in the OS system of MS Windows 95 or later version using Microsoft Visual C++ 6.0 that provides MFC (Microsoft Foundation Class). In order to access the data base of SDB-21C, the function of ODBC (Open Data Base Connectivity) was used.

Three-dimensional Graph Generator was developed for the presentation of the parametric model results. This tool creates a dynamic three-dimensional graph with the coefficient of a polynomial equation that is provided in the data base of the parametric model. The flow chart of the structure of SDB-21C is given in Fig.1.
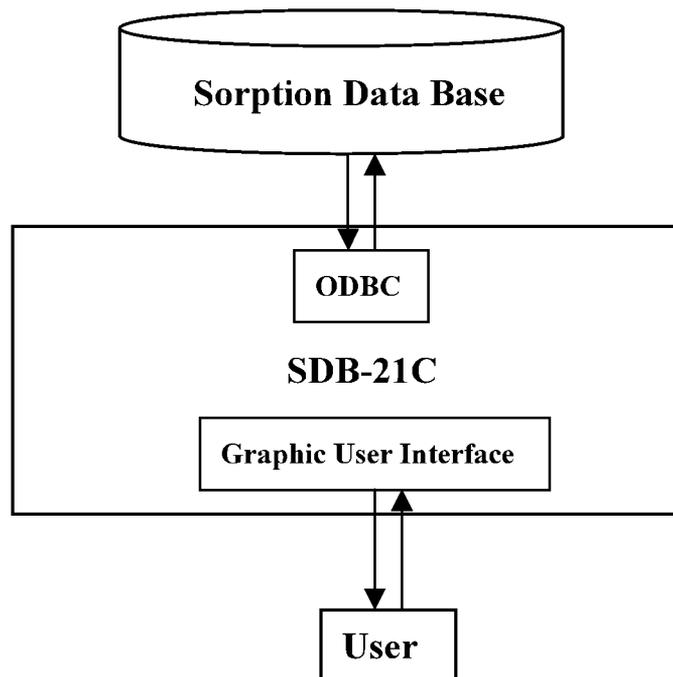

FIG. 1. The flowchart of the structure of SDB-21C.

3. COMPILATION OF KAERI SORPTION DATA

Around 2,000 distribution coefficients were collected up to now in a consistent manner, and the addition of new data is under progress. The format for the sorption data and related experimental information was same as that of the NEA SDB. The current status of compiled sorption data is shown in Fig.2.

About 100 data sets for the parametric model were compiled in SDB-21C up to now. The most of data sets were taken from the work of KAERI and ATOMIC Energy of Canada Ltd. (AECL) [3,4]. The format of the data set is similar to the original work of AECL.

4. FUNCTIONS OF SDB-21C

Many functions were included in the SDB-21C in order to facilitate the accessibility of the sorption data base and to improve the presentation of the data. These would enable users to manipulate the data in more efficient and convenient way.

The major functions included in SDB-21 are as follows.

(1)   Search:

- Compared with dBASE III and MS Access, the search of data base is faster.
- A variety of customized menus are provided in order to facilitate the search.
- The search system adopts a graphic user interface (GUI).
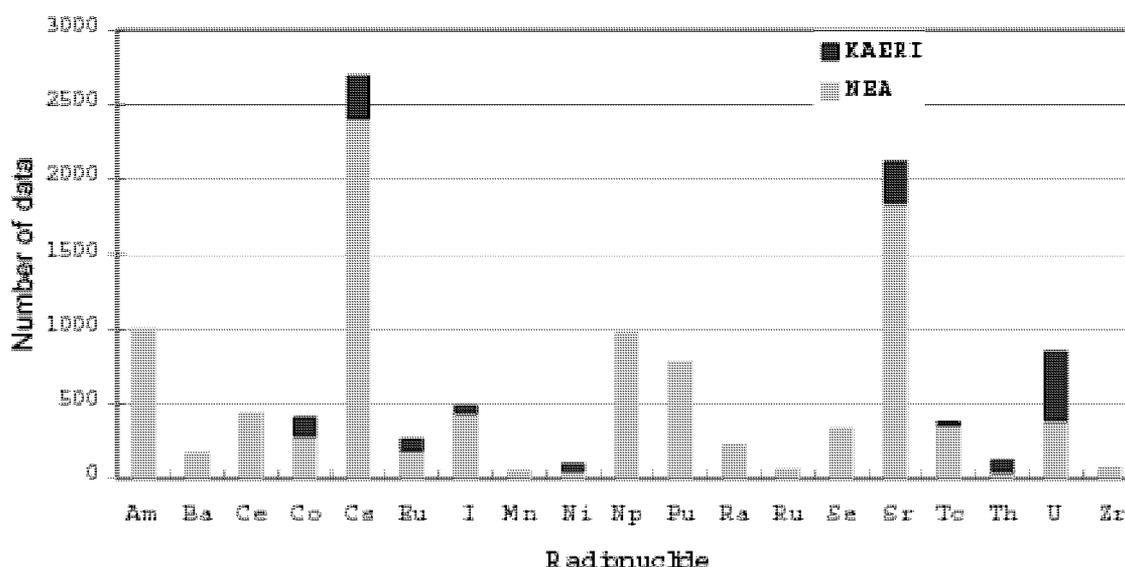

FIG. 2. The compiled sorption data of radionuclides in SDB-21C.

(2)   Tabular and graphic representations:

- Search result can be tabulated and the table can be saved as text format, thus the result can be exported to other spreadsheet programs such as MS Excel.
- Search result can be analyzed by three different graphic representations named K_d, % and isotherm distributions.
- The data set for the parametric model can be evaluated by a dynamic three-dimensional graph.

(3)   Other functions:

- New sorption data can be directly incorporated into the data base of SDB-21C.
- Search results such as tables and graphs can be printed out.
- Sorption data (main data base) and the related information of reference and solid type (subsidiary data base) are hyperlinked in the program.

5. CONCLUSIONS AND FURTHER WORKS

SDB-21C is a versatile tool for the evaluation of sorption data, and contains large amounts of sorption data. By adopting a graphic user interface (GUI), it is quite user friendly. In this respect, it is thought that the use of SDB-21C is very helpful in the field of the environmental safety assessment of radwaste.

The development of a subroutine for the statistic analysis of sorption data is under progress to improve the utility of the data in the performance assessment of radwaste repository. Also a specialist or guideline system needs to be included in order to assist users to select adequate sorption data in the environmental conditions of interest. An Internet version of SDB-21C is under development.

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