

IAEA Fast Reactor Knowledge Preservation Initiative

An initiative to establish a comprehensive, international inventory of fast reactor data and knowledge

Project Focus: **KNK-II Reactor, Karlsruhe, Germany**

**Including Knowledge Base
Full Text CD-ROM**

August 2004



International Atomic Energy Agency

Contents of this Working Material

This Working Material (including the attached CD-ROM) documents progress made in the IAEA's initiative to preserve knowledge in the fast reactor domain. The brochure describes briefly the context of the initiative and gives an introduction to the contents of the CD-ROM.

In 2003/2004 a first focus of activity was concentrated on the preservation of knowledge related to the KNK-II experimental fast reactor in Karlsruhe, Germany. The urgency of this project was given by the impending physical destruction of the installation, including the office buildings. Important KNK-II documentation was brought to safety and preserved just in time.

The CD-ROM contains the full texts of 264 technical and scientific documents describing research, development and operating experience gained with the KNK-II installation over a period of time from 1965 to 2002, extending through initial investigations, 17 years of rich operating experience, and final shutdown and decommissioning.

The index to the documents on the CD-ROM is printed at the end of this booklet in chronological order and is accessible on the CD by subject index and chronological index.

The CD-ROM contains in its root directory also the document 'fr_classification.pdf' which describes the classification system used for the present collection of documents on the fast reactor KNK-II.

Please visit the project web site for current status and access to additional materials.

<http://www.iaea.org/inis/aws/fnss/>

Introduction

In September 2003, in resolution GC(47)/RES/10.B, the General Conference recognized that preserving and enhancing nuclear knowledge and ensuring the availability of qualified manpower are vital to the continued and expanded safe and secure utilization of all nuclear technologies for peaceful purposes. The General Conference urged the Secretariat to continue to strengthen, subject to the availability of resources, its current and planned efforts in this area, recognizing the need for a focused and consolidated approach, and requested the Secretariat to assist Member States, particularly developing ones, in their efforts to ensure the preservation of nuclear education and training in all areas of nuclear technology for peaceful purposes. The General Conference further encouraged Member States to promote the networking of institutions for such nuclear education and training and requested the Director General to note the continuing high level of interest of Member States in the range of issues associated with nuclear knowledge in the process of preparing the Agency's programme.

In the Agency's Programme and Budget for 2004–2005, Programme C, Capacity Building and Nuclear Knowledge Maintenance for Sustainable Energy Development in Major Programme 1, reflects the increased importance of nuclear knowledge management activities. In response to operating paragraph 5 of GC(47)/RES/10.B, the ongoing preparation of Programme and Budget 2006-2007 further reflects its importance and focal point position in Major Programme 1 by redefining the missions of the International Nuclear Information System (INIS) and the Library in support of nuclear knowledge activities and in addition by introducing dedicated knowledge management activities in other Major Programmes.

One of these dedicated activities is the Agency's Fast Reactor Data Retrieval and Knowledge Preservation Initiative implemented within the Nuclear Power Technology Development Section. The present Working Material gives a brief overview of the initiative, and presents the results obtained since the September 2003 General Conference.

Why Fast Reactor Knowledge Preservation?

For three decades several countries had large and vigorous fast breeder reactor development programs. Fast reactor development programs were at their peaks by 1980. Fast test reactors (Rapsodie (France), KNK-II (Germany), FBTR (India), JOYO (Japan), DFR (UK), BR-10, BOR-60 (Russia), EBR-II, Fermi, FFTF (USA)) were operating in several countries, with commercial size prototypes (Phénix, Superphénix (France), SNR-300 (Germany), MONJU (Japan), PFR (UK), BN-350 (Kazakhstan), BN-600 (Russia)) just under construction or coming on line. From that time onward, fast reactor development in general began to decline. By 1994 in the USA, the Clinch River Breeder Reactor (CRBR) had been cancelled and the two fast reactor test facilities, FFTF and EBR-II had been shutdown - with EBR-II permanently, and FFTF in a standby condition. Thus, effort for fast breeder reactor development essentially disappeared. Similarly, programs in other nations were terminated or substantially reduced. In France, Superphénix was shut down at the end of 1998; SNR-300 in Germany was completed but not taken into operation, and KNK-II was permanently shut down in 1991 (after 17 years of operation) and is scheduled to be dismantled by 2004; in the UK, PFR was shut down in 1994; BN-350 in Kazakhstan was shut down in 1998.

Loss of the fast reactor knowledge should be taken seriously. The delay and economic impact of restoring the fast reactor option a few decades from now without the present knowledge would be enormous. By that time, all the facilities needed to generate the information originally, and the people who possessed the knowledge would be long gone.

Recently, renewed interest in fast neutron spectrum systems is coming from the efforts to investigate incineration and transmutation of long-lived radwaste in sub-critical hybrid systems (e.g., driven by spallation neutron sources). However, it must be stressed, that this must be supplemented by an aggressive data retrieval and knowledge/technology preservation and archival effort.

The IAEA Initiative

The Agency is in a good position to provide the framework for knowledge preservation efforts. Under Article III of its Statute, the IAEA is mandated to “encourage and assist research on, and development and practical application of atomic energy for peaceful uses throughout the world”. Obviously, an important aspect of this mandate is maintaining and increasing the knowledge that is necessary for the technological development. With regard to the fast reactor technology area, many Member States have repeatedly underscored the importance of knowledge preservation and transmission to the young generation. In response to expressed needs by Member States, the IAEA [within the framework and drawing on the wide expertise of its Technical Working Group on Fast reactors (TWG-FR)] has undertaken concrete steps towards the implementation of a fast reactor data retrieval and knowledge preservation initiative (FRKP).

The objective of the initiative is to develop a Knowledge Base into which existing Knowledge Preservation Systems will fit, and which will complement and integrate future Member States’ efforts to preserve fast reactor data and knowledge. Its outcome will be an international Knowledge Base, widely used through a WWW-Portal established and maintained by the Agency. The initiative relies on both IAEA and Member States contributions. The Agency contributes its own data and knowledge accumulated over more than 35 years of activities performed within the frame of the TWG-FR [formerly International Working Group on Fast Reactors (IWG-FR)]. It will further create a FRKP network among the interested Member States, and will support and coordinate FRKP activities in Member States. Last, but not least, it is developing means for precise and efficient knowledge retrieval through specialized taxonomies and classification systems. Fast reactor knowledge will be made accessible on suitable platforms, including an Internet based knowledge portal.

However, the responsibility for data retrieval and interpretation, as well as quality assurance, will rest with the individual Member States joining the initiative. The Member States’ contributions can be summarized as follows:

- Identification of the location of fast reactor development, operation, and decommissioning data and knowledge
- Assessment of the quality and completeness of the data and information, as well as of the degree to which it is endangered
- Conversion of the data into a robust and secure digital form
- Development of interpretive documents that are defining the final state of affairs and its rationale
- Preparation of bibliographical records, including index/key words in cooperation with and using INIS resources
- Facilitation of the provision of access to the information (not necessarily open release if commercial) within the international Knowledge Base to be administered and preserved by the IAEA.

Status of the IAEA Initiative

Over the period covered by this Working Material, the IAEA activities were focused on two issues: firstly, support for retrieval and archiving (using INIS capabilities) of data and information related to the German experimental fast reactor KNK-II (presently being

dismantled), and, secondly, in collaboration with INIS, development of fast reactor taxonomies and specifications of the Fast Reactor Knowledge Portal.

The sources for the KNK-II data and documents included the KNK archive, still available in the KNK building, containing project related documents (e.g., operational history, operational experience and lessons learned documentation, etc), and personal archives from retired FZK and INTERATOM staff containing mostly R&D related documents and also scientific publications which were not yet stored in INIS. The information was retrieved, some 500 documents quality checked, and finally 191 were deemed worth preserving. For these, bibliographic records and full texts were included into INIS. All in all, 264 documents were digitised (mostly from originals yielding very high quality electronic files, and a few from microfiches) and OCRed, thus ensuring full-text search capabilities.

Work started on the Fast Reactor Knowledge Portal. A hierarchical structure, indexing, and taxonomies for the classification of fast reactor data and knowledge was established in collaboration between NPTDS and INIS, and with the support from the TWG-FR.

Contents of the Beta-Version Knowledge Base (CD ROM)

The attached CD-ROM contains the full texts of 264 selected documents related to KNK-II. The documents are stored in PDF and access is facilitated via index pages in HTML. A chronological list of all documents presented follows:

- About the behavior of Zirconium hydride solid bodies under reactor irradiation**
Greiner, L.;Paetz, P.;Staubwasser, W (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1965
- SNEAK-4, a series of physics experiments for KNK II**
Engelmann, P (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1969
- Development work for the moderator of the ITR-fuel**
Duenner, P.;Becker, D (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1973
- Diverse shutdown systems for the KNK-1, KNK-2, and SNR-300 reactors**
Morgenstern, F.H.;Buchholz, H.;Krueger, H.;Roehrs, H. (INTERATOM, Bensberg, Ger.) - 1974
- Operating experience and design criteria of sodium valves**
Markford, D. (INTERATOM, Bensberg, Ger.) - 1974
- Statistical hot spot analysis of reactor cores**
Schaefer, H (INTERATOM GmbH, Bergisch Gladbach (Germany)) - 1974
- KNK II: Supply of the Compact Sodium Cooled Reactor Plant with a fast core (Final report for the experimental tasks of the project oriented R and D program)**
INTERATOM GmbH, Bergisch-Gladbach (Germany) - 1975
- INTERATOM Program: Program DLS**
Groenefeld (Internationale Atomreaktorbau G.m.b.H. (INTERATOM), Bensberg/Koeln (Germany, F.R.)) - 1976
- The carbide fuel element for the reload of the KNK-II**
Bojarsky, E. (Kernforschungszentrum Karlsruhe (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung) - 1976
- The SNR-Cores: KNK-II, SNR-300 up to SNR-2**
Hoechel, J. (Internationale Atomreaktorbau G.m.b.H. (INTERATOM), Bergisch Gladbach (Germany, F.R.)) - 1976
- Heat transfer calculations on the KNK II emergency cooling system**
Vossebrecker, H.;Groenefeld, G (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1976
- Basic concept and design data of a nuclear sodium boiling experiments in KNK II**
Edelmann, M (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1976
- Status of the USSR fast reactor programme as of March 1977**
Krasnojarov, N.V.;Inyutin, E.I - 1977
- Documentation of the SILOE experiments results (Experiment S2)**
Glauner, W.;Plitz, H (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1977
- Compact sodium cooled nuclear power plant with fast core (KNK II- Karlsruhe), Safety Report**
INTERATOM GmbH, Bergisch-Gladbach (Germany) - 1977
- KNK II Second Core - Feasibility Study IIa**
INTERATOM GmbH, Bergisch Gladbach (Germany) - 1977
- Safety aspects about the installation of a nuclear boiling generator in KNK II**
Mitzel, F (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1977
- Transfer functions between the central fuel temperature, the cladding temperature and the power of fuel assemblies**
Ferranti, P.;Mitzel, F (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1977
- Feasibility study of a sodium boiling experiment at KNK II at nuclear power**
Edelmann, M.;Artz, D.;Bestenreiner, G.;Dorr, B.;Erhardt, J.;Hoppe, P.;Huber, F.;Kempe, H.;Mitzel, F.;Reimann, G.;Ricken, E.;Schaefer, L.;Schleisiek, K.;Schwarz, M.;Seitz, H.;Steinbock, K.;Vaeth, W.;Venker, H.;Zihla, W (Kernforschungszentrum Karlsruhe GmbH (Germany), INTERATOM;Bergisch-Gladbach (Germany)) - 1977
- Instrumentation, threshold and signal processing for the nuclear boiling generator of KNK II**
Erhardt, J.;Hoppe, P (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1977
- Thermal-hydraulic and hydrodynamic investigations for the nuclear boiling generator in KNK II**
Dorr, B.;Schleisiek, K (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1977
- Detection of local sodium boiling in the nuclear boiling generator in KNK II and in the cores of SNR 300 and SNR 2**
Erhardt, J.;Hoppe, P (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1977
- Assessment of the design of oxidic fuels and acceptance criteria for fuel elements (KNK 2, KWO)**
Beisswenger, H.;Brodth, F. (Technischer Ueberwachungs-Verein Baden e.V., Karlsruhe (Germany, F.R.)) - 1978
- Status of fast breeder reactor development in the Federal Republic of Germany, Belgium and the Netherlands**
Daeunert, U. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany));Kessler, G. (Kernforschungszentrum Karlsruhe, Karlsruhe (Germany)) - 1978
- On-line gamma spectroscopy system for observation of the cover gas of KNK II, description and instruction**
Hoffmann, G.;Letz, K.D (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1978
- Out-of-pile experiments with an electrical boiler for Acoustic Boiling Detection**
Aberle, J.;Bartholomay, R.;Reimann, G.;Rohrbacher, H.A.;Schleisiek, K (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1978
- Influence of fuel pin bowing on the temperature distribution in fuel pin cladding tubes in case of sodium cooling. - Experimental results**
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- Moeller, R.;Tschoeke, H.;Kolodziej, M (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1978
- Concepts of annular fuel elements for installation of irradiation inserts in KNK II and layout of a carbide test bundle**
Haefner, H.E.;Philipp, K (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1978
- The behavior of the fuel pins of the fuel element NY 205 of KNK II**
Goetzmann, O (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1978
- Local coolant flow perturbations in KNK II - coolant inlet blockages of assemblies of the test and driver zone**
Duesing;Friedel;Gerling (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1978
- Nuclear startup of the Compact Sodium Cooled Nuclear Power Plant KNK II, Zero Power Tests**
Feltes, W.;Richard, H.;Schmidt-Hoenow, M.;Stroemich, A.;Wilhelm, H (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1978
- KNK II, Compact Sodium-Cooled Reactor in the Nuclear Research Center Karlsruhe**
INTERATOM GmbH, Bergisch-Gladbach (Germany) - 1978
- Nuclear startup of the compact sodium-cooled nuclear power plant KNK II, zero power tests**
Richard, H.;Schmidt-Hoenow, M.;Feltes, W.;Stroemich, A.;Wilhelm, H (Kernkraftwerk-Betriebsgesellschaft mbH (Germany), INTERATOM GmbH Bergisch-Gladbach (DE)) - 1978
- The KNK II test program**
Kathol, W (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1978

Axial fission rate distribution in SNEAK 11A

- Moellendorff, U. von;Henneges, G (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1978
- Investigations concerning gas entrainment at KNK II**
Hoppe, P.;Massier, H.;Mitzel, F.;Vaeth, W (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter) - 1979
- Status of the DEBENE fast breeder reactor development, March 1979**
Daeunert, U.;Kessler, G - 1979
- Design report for core assemblies of KNK II: Driver zone assemblies with moderator**
Huesken, J.;Fenneker, K.;Singer, J.;Zihla, W.;Coors, D (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1979
- Design report for core assemblies KNK II/2: Secondary shutdown assemblies**
Koenigsdorf, E.;Huesken, J.;Schmitz, K.J.;West, G.;Zolti, E (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1979
- Design report for core assemblies KNK II/2: Standard control assemblies and control assemblies with test pins**
Ricken, E.;Schmitz, K.J.;West, G.;Sperber, F.;West, G.;Zolti, E (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1979
- Detection of the first fuel pin failure in KNK II**
Hoffmann, G.;Jacobi, S.;Jonatzke, O.;Letz, K.D.;Schmitz, G (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1979
- Measurement and calculation of the reactivity-to-power transfer function of KNK II for the examination of the reactivity coefficients of the first core**
Mitzel, F.;Vaeth, W (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1979
- Vibration measurements at KNK II**
Hoppe, P.;Massier, H.;Mitzel, F.;Vaeth, W (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1979
- Investigations of gas entrainment in KNK II**
Hoppe, P.;Massier, H.;Mitzel, F.;Vaeth, W (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1979
- Detection of local cooling disturbances in the core of SNR 300 by Delayed Neutron Detection DND and by fuel element outlet temperature surveillance**
Schleisiek, K (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1979
- The irradiation of carbide fuel pins in the frame of the Fast Breeder Project**
Steiner, H (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1979
- Investigation of different reactor protection systems**
Eggenberger, O.;Gmeiner, L.;Nehmer, J.;Racke, W.;Voges, U (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1979
- Test of In-core Flux Detectors in KNK II**
Hoppe, P.;Mitzel, F (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1979
- KNK II - JOYO Information Exchange, Proceedings of the 3rd Expert-Meeting**
Kernforschungszentrum Karlsruhe GmbH (Germany) - 1979
- Subcritical experiments in SNEAK 11B1**
Henneges, G.;Moellendorff, U. von (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1979
- On-line gamma spectroscopy measuring station for cover gas monitoring at KNK II**
Hoffmann, G.;Letz, K.D (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung;Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter) - 1980
- Simulation of fuel element thermal hydraulics for sensitive monitoring of coolant flow**
Edelmann, M. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik) - 1980
- Annual meeting on nuclear technology 1980. Technical meeting: Operating experiences**
Deutsches Atomforum e.V., Bonn (Germany, F.R.) - 1980
- Operating experiences with the KNK-2 reactor**
Brudermueller, G. (Kernkraftwerk-Betriebsgesellschaft m.b.H., Eggenstein-Leopoldshafen (Germany, F.R.)) - 1980
- Pin, assembly and core design for the extended residence time of the first core of KNK II**
Fenneker, K.;Menssen, R.;Ricken, E.;Spence, H.;Sperber, F.;Wehmann, U.;West, G (INTERATOM GmbH, Bergisch Gladbach (Germany)) - 1980
- Development of an absorber pin with diving bell**
Dreyer, G (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1980
- KNK II, MTE II design report, temperature distribution**
Puetz, H (INTERATOM GmbH, Bergisch Gladbach (Germany)) - 1980
- Release of fission products from the KNK II fuel element failure and search for released fuel in the primary sodium**
Hanke, H.-D.;Clauss, H.;Stamm, H.-H (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1980
- Investigations of the gas passage through the reactor core of KNK II**
Hoechel, J.;Schott, H (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1980
- Model experiments for the problem of the gas storage and gas transport in the KNK reactor**
Voj, P.;Granner, N.;Penny, W (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1980
- Safety related investigations for the second and third operation period of KNK II**
Friedel, G.;Groenefeld, G.;Lenzen, M.;Nebel, H.;Pueschel, H.;Schade, H.-J.;Stepan, G (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1980
- First KNK II Seminar, September 1980**
Kathol, W (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1980
- BMFT-CEA-US-DOE Exchange on Fast Breeder Reactors, Proceedings of the 1st Expert-Meeting at Karlsruhe March 24 and 25, 1980**
Kernforschungszentrum Karlsruhe GmbH (Germany) - 1980
- Comparison of diffusion- and transportcode-results in the course of the evaluations of the SNEAK 11B1 control rod experiments**
Henneges, G.;Kuefner, K (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1980
- KNK II irradiation project of an annular element with 19-pin carbide test bundle on a ring position of the test zone**
Haefner, H.E.;Steiner, H.;Weinberg, D.;Norajitra, P.;Frey, H.H (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1980
- SNEAK-11: Mockup critical studies of a small sodium-cooled fast reactor**
Moellendorff, U. von;Helm, F (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1980
- Identification of vibrational effects in KNK II fuel elements**
Vaeth, W.;Mitzel, F.;Ansari, S (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik;Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter) - 1981
- Analysis of reactivity noise measured at KNK II with respect to vibrations of control rods and primary loop components**
Mitzel, F.;Ansary, S.;Vaeth, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)) - 1981
- Decladding of fast breeder reactor fuel elements with lattice spaces**
Bestenreiner, G. (Internationale Atomreaktorbau G.m.b.H. (INTERATOM), Bergisch Gladbach (Germany, F.R.)) - 1981
- Status of the fast breeder reactor development in the Federal Republic of Germany, Belgium and The Netherlands, February 1981**
Hueper, R.;Frieese, R. (Kernforschungszentrum Karlsruhe, Karlsruhe (Germany)) - 1981
- Core design of the second core of KNK II**
Spence, H (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1981
- Design report for core assemblies of KNK II/2: Mark II assemblies of the test zone (Central position)2.4 and 2.5**
Fenneker, K.;Heinecke, J.;Singer, J.;Sperber, F (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1981
- Design report for core assemblies of KNK II/2: Driver zone assemblies without moderator**
Bestenreiner, G.;Fenneker, K.;Ricken, E.;Singer, J.;Sperber, F (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1981
- Design report for core assemblies of KNK II/2: Mark II test zone fuel assemblies on the first ring 2.1, 2.2, 2.3, 2.6, 3.1, 3.3 and 3.5**
Bestenreiner, G.;Fenneker, K.;Heinecke, J.;Singer, J.;Sperber, F (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1981

- Potential and state of development of acoustic boiling detection methods in sodium cooled reactors**
Rohrbacher, H.A.;Schleisiek, K (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1981
- Analysis of reactivity noise observed at KNK-II with respect to vibration of control rods and primary loop components**
Ansari, S.;Mitzel, F.;Vaeth, W (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1981
- Avoidance of gas bubble caused scrams at KNK II without reducing the sensitivity of the reactimeter to bulk sodium boiling**
Vaeth, W (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1981
- Design of the grid-plate inserts of the second core of KNK II**
Schade, H.-J (INTERATOM GmbH, Bergisch-Gladbach (Germany)) - 1981
- KNK II, Safety Report for the second core, following cores and the test program**
INTERATOM GmbH, Bergisch-Gladbach (Germany) - 1981
- Description of the KNK II first core und its assemblies for an extended residence time of 400 equivalent full-power days**
Schade, H.J.;Toebbe, H.;Wehmann, U (INTERATOM GmbH, Bergisch Gladbach (Germany)) - 1981
- PNC/CEA/DEBENE specialists' meeting on LMFBR plant experience, Cadarache, FRANCE, October 1981**
Kernforschungszentrum Karlsruhe GmbH (Germany) - 1981
- Power operation start-up of the compact sodium-cooled nuclear power plant KNK II/1**
Richard, H.;Schmidt-Hoenow, M (Kernkraftwerk-Betriebsgesellschaft mbH (Germany), INTERATOM GmbH Bergisch-Gladbach (DE)) - 1981
- KNK - annular fuel element with carbide test bundle: Estimation of the sodium outlet temperature in case of obstruction of the test bundle, respectively the annular carrier element KNK**
Norajitra, P (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1981
- Technical specifications for the fuel pin of the carbide element in the test zone of KNK II/2**
Freund, D.;Jacobi, O.;Ritzhaupt-Kleissl, H.-J.;Steiner, H (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1981
- Measurement of the fission rate distribution in SNEAK 11B2**
Moellendorff, U. von (Kernforschungszentrum Karlsruhe GmbH (Germany)) - 1981
- Fuel reprocessing of the first failed KNK-II fuel element in MILL**
Bleyl, H.J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Heisse Chemie) - 1982
- Experience on fuel recycling**
Schneider, V.;Druckenbrodt, W.G. (Alpha Chemie und Metallurgie G.m.b.H.) - 1982
- KNK-II fuel elements and their operational behavior**
Mayer, H. (Internationale Atomreaktorbau G.m.b.H. (INTERATOM), Bergisch Gladbach (Germany, F.R.));Richard, H. (Kernkraftwerk-Betriebsgesellschaft m.b.H., Eggenstein-Leopoldshafen (Germany, F.R.)) - 1982
- The reference concept of the KNK-2 back end fuel cycle**
Schnetgoeke, G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter) - 1982
- Sodium removal from fuel elements**
Stade, K.C.;Breitlaender, H. (Kernkraftwerk-Betriebsgesellschaft m.b.H., Eggenstein-Leopoldshafen (Germany, F.R.));Stamm, H.H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Radiochemie) - 1982
- Dismantling and post-irradiation examination of the two first defective fuel pins of the KNK-II**
Enderlein, H.;Kathol, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Kerntechnische Betriebe;Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter) - 1982
- Conceptual study on the interim underwater storage of KNK-II fuel elements**
Wasinger, K. (Kraftwerk Union A.G., Offenbach am Main (Germany, F.R.)) - 1982
- Conceptual design for interim storage of KNK II-fuel elements in a block storage facility**
Arntzen, P.;Gasch, A. (Nuklear-Chemie und -Metallurgie G.m.b.H. (NUKEM), Hanau (Germany, F.R.)) - 1982
- Concept on the interim storage of KNK-2 spent fuel elements in transport or storage containers**
Bergmann, W.;Dries, G.;Laug, R. (Transnuklear G.m.b.H., Hanau (Germany, F.R.)) - 1982
- Reprocessing of KNK II reactor fuel rods at the MILLI plant**
Bleyl, H.J.;Ochsenfeld, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Heisse Chemie) - 1982
- Detection of fuel element vibration at KNK II**
Mitzel, F.;Vaeth, W.;Ansari, S (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik;Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter) - 1982
- Status of the fast breeder reactor development in the Federal Republic of Germany, Belgium and the Netherlands**
Hueper, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter) - 1982
- Progress report on research and development in 1981 of Institut fuer Radiochemie**
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Concept for dismantling the reactor vessel and the biological shield of the compact sodium-cooled nuclear reactor facility (KNK)

Hillebrand, I. (Forschungszentrum Karlsruhe (Germany)); Benkert, J. (Westinghouse Reaktor (Germany)) - 2002

Concept for dismantling the reactor vessel and the biological shield of the compact sodium-cooled nuclear reactor facility (KNK) (viewgraphs)

Pfeifer, W.; Hillebrand, I. (Forschungszentrum Karlsruhe GmbH (Germany)) – 2002

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