

Nuclear Materials Science

The Institute for Nuclear Materials Science (NMS) carries out research on materials and fuels used in present and future reactor systems. NMS makes numerical simulations and predictions of the behaviour of materials under irradiation. This knowledge is essential to guarantee the safe and efficient operation of nuclear installations. NMS also produces radioisotopes for the medical sector and doped silicon for the microelectronics industry.

Advanced Nuclear Systems

The Institute for Advanced Nuclear Systems (ANS) strives to extend the Belgian expertise in the study of innovative fourth-generation reactors and the fusion test reactor ITER in France. These new technologies will be safer and more efficient. With MYRRHA, ANS develops a multifunctional experimental irradiation facility for the production of radioisotopes, the transmutation of radioactive waste and the training of a new generation of scientists and engineers.



STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

Belgian Nuclear Research Centre

SCK • CEN is one of the largest research centres in Belgium. Today more than 600 employees advance the peaceful industrial and medical applications of nuclear science.

The Belgian Nuclear Research Centre was created in 1952. Since 1991, the statutory mission gives priority to research on issues of societal concern such as safety of nuclear installations, radiation protection, safe treatment and disposal of radioactive waste, education and training.

SCK • CEN develops, gathers and spreads its knowledge through education and communication. The available know-how and facilities are also used for services to the nuclear industry, the medical sector and the government.

SCK • CEN's fields of expertise go - literally - from the deep underground to outer space. Our research activities are concentrated into the following main tracks:

Environment, Health and Safety

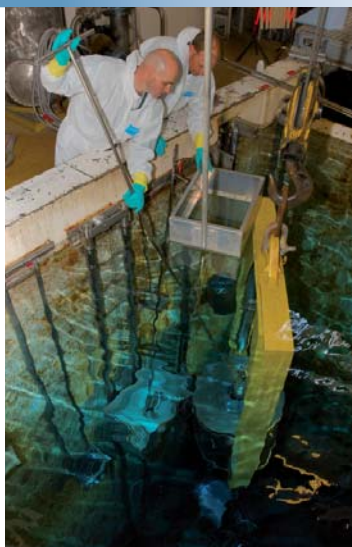
The Institute for Environment, Health and Safety (EHS) studies the behaviour of radioactive substances in air, water and the underground and evaluates the effects of radiation on man and environment. Based on this knowledge, EHS makes practical recommendations to the government, the industrial and the medical world. EHS also pays attention to the societal and ethical aspects of nuclear technologies such as sustainable development, safety and legal issues.

Education and Training

Throughout its more than 50 years of research experience in the field of peaceful applications of nuclear science, SCK • CEN has also earned a reputation as an outstanding centre for education and training (E&T). The E&T activities at SCK • CEN cover a. o. reactor physics, reactor operation, reactor engineering, radiation protection, decommissioning, waste management and emergency planning.

Next to courses, SCK • CEN also offers students the possibility to perform their research work at its laboratories and research reactors. Final-year students and PhD candidates can enter a programme, outlined together with an SCK • CEN mentor, and in close collaboration with a university promotor. Docs and post-docs are recruited in specialised research domains that reflect the priority programmes and R&D topics of our institute.

Main research facilities



BR2

Belgian Reactor 2 or BR2 is a materials testing reactor. Since the start in 1961, it has been one of the most powerful research reactors in the world. It functions using high-enriched uranium and is moderated and cooled with water. BR2 tests nuclear fuels and materials for several reactor types and for the European nuclear fusion programme. It contributes to guaranteeing the safety of current and future nuclear installations.

BR2 is also an important instrument for the production of radioisotopes for medical and industrial applications, and for the irradiation (doping) of silicon destined for the microelectronics industry.



BR1

Belgian Reactor 1 or BR1, operational since 1956, is the oldest research reactor in Belgium. It is an air-cooled, graphite-moderated reactor. BR1 is used, among others, to detect very small amounts of specific elements in materials. The reactor is available to other research centres, universities and the industry, and plays an important role in the education of scientists.



VENUS

The VENUS reactor was used to test the validity of reactor calculations, which prove their usefulness during the exploitation of nuclear installations in order to use the nuclear fuel in a more efficient manner. In 2008, the conversion of VENUS initiated in preparation of the GUINEVERE project that will support MYRRHA. Both projects contribute to the development of fourth generation reactors (Gen IV).



BR3

Belgian Reactor 3 or BR3 was a prototype of a pressurised water reactor. It was selected as European pilot project to demonstrate the feasibility of a reactor decommissioning and to guarantee its safety. SCK•CEN developed new techniques to limit the amount of radioactive waste and elaborates procedures to minimise the radiation load for the employees. All data were collected in a database in order to predict the economical costs and the radiological impact of new similar projects.



HADES

The HADES laboratory lies at a depth of 225 meters under the domain of the SCK•CEN and allows the study of deep clay as potential storage place for long-lived and high-active nuclear waste. EIG EURIDICE, the Economic Interest Grouping between NIRAS/ONDRAF and SCK•CEN, exploits this lab and executes scientific research. At the beginning of this century, the infrastructure was expanded with an additional gallery in order to execute experiments at large scale regarding the feasibility and the safety of storage of heat-emitting nuclear waste.

LHMA

The Laboratory for High and Medium level Activity evaluates the effects of irradiation on materials at use in actual and future nuclear installations. A wide variety of mechanical, physico-chemical and microstructure research tools are available in and out of remotely-operated hot-cells. The laboratory is involved in applied and fundamental research supported by mathematical modelling to verify and predict the behaviour of the nuclear materials during service life.

Nuclear analysis and chemical laboratories

SCK•CEN measures and evaluates the internal contamination in employees of the nuclear sector and verifies the possible contamination with radiation doses. Laboratories also control the contamination of the environment and the food chain. The results are important for the nuclear emergency plan, among others, to which the SCK•CEN considerably contributes at Belgian and European level. The laboratory for radiochemical analyses uses shielded installations and separation methods for the analysis of nuclear fuels and other nuclear materials. The lab for reactor and nuclear measurements provides services in the domains of gamma ray spectrometry, neutron activation analysis and reactor dosimetry. The laboratories also support the research reactors and other labs for destructive and non-destructive research on radioactive material.

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