Carotage by the fission neutrons method (CFNM) is used for direct determination of uranium contents along the mined well section and is indispensable for tracking the uranium leaching process, at which the radiological properties of ores (uranium-radium ratio) are destroyed by the technological processes.

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PROLIFERATION RESISTANCE FEATURES IN NUCLEAR REACTOR DESIGNS

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The presentation gives an overview of the fundamental principles of non-proliferation of nuclear materials and technologies in the process of designing the nuclear reactors. The nuclear power engineering includes the activities involving the risk of proliferation of nuclear weapons (such as separation of uranium isotopes (enrichment), long-term storage of irradiated fuel, reprocessing of irradiated fuel by means of separation of plutonium and/or uranium wherefrom, storage of separated fissile materials). Proliferation resistance can be defined as the characteristic of a given nuclear power system which would prevent change-over or unauthorized production and use of the nuclear materials or technologies intended to possession of nuclear weapons or other nuclear explosives. The basic principles of non-proliferation as formulated in the frame of IAEA-sponsored international project INPRO have been analyzed for their relevance in designing the innovative nuclear power systems based on lead-cooled fast reactors.

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HADRONS IN NUCLEAR MATTER

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High energy collisions of Hadrons or finite Nuclei with nuclei can generate locally high density and temperature. In such a case there will be copious production of mesons and baryons with strange, charm and bottom quarks. This will allow a study of their behaviour in nuclei, thus opening a vast range of new nuclear physics that complements the usual nuclear physics. The propagation and decay of these tagged particles will help us to understand the role of high density and temperature. There is also a large probability of producing double hypernuclei, thus allowing a study of interaction among hyprons.

At present Japan Hadron Facility is focussed on such studies. However colliders like RHIC, that is able to study the deconfinement transition, and LHCb, the b meson facility at LHC, will add a great deal of new information.

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ASYMPTOTIC NORMALIZATION COEFFICIENT (NUCLEAR VERTEX CONSTANT) AND NUCLEAR ASTROPHYSICS PROBLEM
(Review)

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A reliable estimation of rates of nuclear astrophysical radiative cupture reaction $A(a,\gamma)B$ responsible for the abundance of the light elements B in the Universe is one of the most important problems of the modern astrophysics [1]. Solution of this problem in its turn is impossible without obtaining the cross sections (or their equivalent the astrophysical S(E) factors for the reactions under consideration.

In this report the review of the results of calculations of the astrophysical S- factors S(E) for the $t(\alpha, \gamma)^7Li$, $^3He(\alpha, \gamma)^7Be$, $^7Be(p, \gamma)^8B$, $^{12}C(p, \gamma)^{13}N$ and $^{13}C(p, \gamma)^{14}N$ reactions at extremely low energies E, including value E=0, performed within the framework of the new two –body approach and the R-matrix method are presented. The calculation is carried out taking into account the information about the asymptotic normalization coefficient (or the respective nuclear vertex constant of virtual decay of the residual nuclei into two fragments of the initial states of the aforesaid reactions , which belong to the fundamental nuclear constants). The required values of the asymptotic normalization coefficients can be obtained from an analysis of both the same direct cupture reactions performed within the modified two-body approach and the peripheral proton transfer reactions performed within the framework DWBA approach. A comparative analysis between the experimental and theoretical results obtained by different authors is also done.

Reference:

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