

2nd International Conference on

ATOMIC AND NUCLEAR PHYSICS

November 08-09, 2017 | Las Vegas, USA

Nuclear power as an energy source

Leonid Ponomarev

A A Bochvar High Technology Research Institute of Inorganic Materials, Russia

The discovery of nuclear energy is the most significant event in the mankind history since the taming fire. However, the contemporary nuclear power based on the thermal reactors with U-235 fuel has no sustainable future. After 60 years of its operation some developed countries have decided to close nuclear power. The reasons for such a decision refer to the principal problems of the contemporary nuclear power: safety, resources, radioactive wastes, nonproliferation and economic problems. The roots of these problems are in the history of the nuclear power: it is the byproduct of the military applications of nuclear energy. In 80-s Alvin Weinberg insisted that nuclear power needs in the new start and it should be based on the inherent safety reactors. As a candidate for such a reactor Weinberg proposed the molten salt reactor (MSR) with Th-U fuel. However, this reactor can't solve the resource problem because the neutron balance in the thorium thermal reactor is poor in comparison with one of the fast U-Pu reactor. Fast MSR with U-Pu fuel (U-Pu FMSR) is possible only if the concentration of heavy elements (especially Pu) in the fuel composition exceeds 10 at.%, but such a salt was not known till recently. Four years ago two experimental groups from Russia have established that the UF_4 , PuF_3 and AmF_3 solubility in eutectics LiF-NaF-KF (FLiNaK) is 45, 33 and 43 mole % respectively. For the first time this observation allows to combine three ideas: the fast neutron spectrum, the liquid fuel and the closed U-Pu fuel cycle. It opens the way for the solution three of the five nuclear power problems: inherent safety, resource and minor actinide incineration. The problems of nonproliferation and economics of closed nuclear fuel cycle are also simplified. I think this way for reviving nuclear power has to be studied thoroughly.

leonidp2008@mail.ru