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## Proliferation resistance and safeguardability of very high temperature reactor

Since the accident at Fukushima Daiichi Nuclear Power Plant on March 2011, the reliance on nuclear energy has been decreased. The Very High Temperature Reactor (VHTR) has its inherent safety, enabling mass production of hydrogen for the future hydrogen-based society as well as the power generation. Development plans for practical application of VHTR have been rapid since the Fukushima disaster and drawing attention around the world. Therefore, it is very important to consider the safeguards framework of VHTR before its future penetration.

In this study, we evaluate the proliferation resistance (PR) of VHTR in order to analyse diversion/acquisition paths and we reflect it in the design of a safeguards approach, using an estimation method recently developed in JAEA for the gamma rays emitted from spent fuel. For that purpose, we firstly evaluated the intrinsic PR of plutonium (Pu) material against various burnups using some PR evaluation methods. In addition, we assessed the safeguardability of pebble bed type VHTR (PBR). The PBR loads new fuel sphere online at the top and discharges spent fuel sphere with high burnup online as well from the bottom. In order to take that form of refueling, item-based safeguards is impossible to be applied. As the safeguardability was assayed, we revealed the necessity of a new type of burnup monitoring technology to measure the burnup level of fuel sphere just after discharged, taking into consideration the threat of diversion/weaponize scenario particularly with spent fuel sphere with lower burnup. Therefore, we developed an advanced burnup monitoring method.

In this paper, we show the results of the PR evaluation and propose a part of new safeguards approach for VHTR with an advanced burnup monitoring technique.

### Which "Key Question" does your Abstract address?

NEW1.6

### Which alternative "Key Question" does your Abstract address? (if any)

NEW1.1

### Topics

NEW1

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