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Development and Application of High Intensity D-T Fusion Neutron Generator HINEG

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Fusion energy becomes essential to solve the energy problem with the increase of energy demands. Although the recent studies of fusion energy have demonstrated the feasibility of fusion power, it commonly realizes that more hard work is needed on neutronics and safety before real application of fusion energy. A high intensity D-T fusion neutron generator is keenly needed for the research and development of fusion technology. However the intensity of D-T neutron generators currently on operation around the world is lower than 1013n/s, which is severely restricting the research capability.

The Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences (CAS) has launched the high intensity D-T fusion neutron generator (HINEG) project to develop an accelerator-based D-T fusion neutron generator with the neutron yield higher than 10^(15)-10^(16) n/s. HINEG consists of two phases: The first phase, named HINEG-I, aims to have the intensity of 10^(12)-10^(13)n/s in order of magnitude, and the second phase, named HINEG-II, is designed to reach a neutron yield of 10^(15)-10^(16) n/s via high-power tritium target system and high-intensity ion source. HINEG-I has been completed and commissioning with the neutron yield of up to 10^(12)n/s, while the related research on the key technologies of HINEG-II are on-going. HINEG can be used for research and development of nuclear technology and safety, including the validation of neutronics method and software, radiation protection, materials activation and irradiation damage as well as neutronics performance of components. Its application can also be extended to nuclear medicine, radiotherapy, neutron radiography, and other nuclear technology applications. This contribution will summarize all the latest progresses and future plans for the research and development of HINEG.

Eligible for student paper award?

No

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