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Development of small neutron source generated by DD fusion reaction using Dc plasma

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Non-destructive testing is routinely performed in factories. This is essential for quality assurance of products and prevention of serious accidents. Among the various non-destructive testing methods that exist, radiographic transmission testing is suitable for inspecting scratches and structures inside objects. Neutrons, a type of radiation, have a higher penetration power into metals than X-rays, and therefore are expected to be used in the inspection of metal products such as heavy metals. However, since the neutron generator is large, the inspection equipment is too huge to install in factories. Therefore, if neutron generator become smaller, the inspection device can be made smaller, and it will be easier to install neutron inspection. In order to reduce the size of the neutron inspection device, this work tried to reduce the size of the neutron generator. Conventional neutron generators are large because they use nuclear reactors or accelerators. In order to reduce the size of the neutron generator, we used the DD reaction as the principle of neutron generation. Neutrons were generated using the DD reaction. After filling the chamber with deuterium, the pressure was reduced using a vacuum pump. A high-voltage electric current was flowed into the chamber to generate plasma and induce the DD reaction. The chamber was shielded using blocks containing Boric acid, and the moderated neutrons were measured using two detectors with different characteristics, the LiCaAlF6 detector and Neutron counter. The change in the ratio of thermal-neutrons was observed from the difference in the measurement results between the detectors.

Topics

Session D. Biomedical optics and sensors technology

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