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Techniques of tritium decontamination on plasma-facing walls in DEMO

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In fusion DEMOs, tritium (T) decontamination scenario before maintenance begins is a key issue. Hence, it is important that T decontamination under vacuum conditions before opening the plasma vacuum vessels. Currently, JA-DEMO team has not yet determined the allowable value of residual T in the vacuum vessel, but it is necessary to indicate a candidate T decontamination technique. Furthermore, the construction of a short-term maintenance scenario that includes the T decontamination process after plasma operation is stopped, is also important for fusion DEMOs.

Three kinds of candidate techniques of T decontamination are considered in the vacuum conditions; 1. Temperature control by decay heat and baking/cooling, 2. Active wall conditionings, such as glow discharge, ion cyclotron wall conditioning, and electron cyclotron wall conditioning, 3. A selection of working gas and vacuum pressure. Mainly retained tritium on the surface of materials is important for T decontamination. Since T is easily replaced with hydrogen, it is well known that the process of replacing H with T and desorption. Therefore, the ratio of water molecules present in the space is thought to greatly influence T decontamination.

In this presentation, several T decontamination techniques are shown. The fundamental techniques required for decontamination are surface T replacements from H to T in the water of the atmosphere and temperature control. The candidate for T decontamination technologies under DEMO vacuum conditions is discussed based on the results, such as the isothermal desorption, glow discharge cleanings, and T reduction to compare with and without air contaminations, and so on.

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