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Application of 10B ions to detect helium in solid matter

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In the study of the interaction between fusion plasma containing helium and materials, destructive methods with layer-by-layer analysis, methods based on helium recoil nuclei detection, or various simulation studies that measure the change in sample mass under plasma exposure are typically used. The challenge with using recoil nuclei detection lies in the high requirements for surface roughness of the sample, while destructive methods may not be suitable in cases where the surface needs to be preserved, and measuring the absorbed helium mass does not provide information about its distribution within the sample. In this work, we attempted to use 10B ions to analyze the helium content in metals. The reaction 10B(α,p)13C was used in inverse kinematics with the detection of protons emitted in the backward direction, which allow to reduce the requirements for surface roughness. This approach, in addition to quantitative analysis, allows to reconstruct of the helium distribution profile within the material's surface. However, there are certain limitations, such as the very limited number of experimental data for the differential cross section of the 10B(α,p)13C reaction.

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