The role of ion beam analysis in fusion research

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Science and technology efforts in the field of controlled fusion are directed towards the construction and operation of a reactor for electricity production. Within this scope, particle accelerators play an important role by ion beam analysis (IBA) of plasma-facing materials and components (PFMCs).

IBA plays a prominent role in studies of PFMC modification resulting from plasma-wall interactions (PWI) [1, 2], because the studies must quantitatively cover a broad range of species and isotopes used as fuel, gases injected for auxiliary plasma heating or edge cooling, transport markers, wall and diagnostic components and wall conditioning.

Quantitative results can be obtained only based on robust nuclear data sets, i.e., stopping powers and reaction cross-sections. Moreover, often several IBA labs are involved in PFMC studies, which calls for transparent and unified analysis procedures. These aspects have been included in the F11023 IAEA Coordinated Research Project (CRP) entitled “Development and Application of Ion Beam Techniques for Materials Irradiation and Characterization relevant to Fusion Technology”. The project work plan encompasses several important topics:

- Measurements of cross-sections of ^{3}He-induced reactions for ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B,^{12}C, ^{13}C and ^{16}O in the energy range 1 – 6 MeV and reaction angles 120° – 170°.
- Stopping powers of Be and W for H, He, Cu and I ions.
- Experiments relevant to a Round Robin (RR) exercise on laboratory-prepared targets (D-loaded W [3]) and fusion reactor materials from the JET tokamak.
- Elaboration of good practices and procedures.

References

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