ITER test blanket module is the most important components to validate energy production and fuel breeding process for future demonstration reactor. Reduced activation ferritic/martensitic steel is recognized as a promising structural material for breeding blanket systems. And Beryllium must be used as plasma facing materials for ITER in vessel components.

In this work, interfacial properties of beryllium/reduced activation ferritic/martensitic steel (RAF/Ms) joint were investigated for a first wall of ITER test blanket module (TBM). The starting materials were ITER grade Beryllium, S65C and a Japanese RAF/M, F82H. The joint was produced by solid state hot isostatic pressing (HIP) method. Chromium layer with the thickness of 1 µm and 10 µm were formed by plasma vapor deposition on the beryllium surface as a diffusion barrier. The HIP was carried out at 1023 K and 1233 K which are determined by standard normalizing and tempering temperature of F82H. The joint made at 1233 K was followed by tempering at 1033 K. The bonding interface was characterized by electron probe microanalysis (EPMA). The bonding strength was also investigated by isometric four point bending tests at ambient temperature.

EPMA showed chromium layer effectively worked as a diffusion barrier at 1023 K. However, the beryllium rich layer was formed in F82H after HIP at 1233 K followed by tempering. Bending tests revealed that thin chromium layer and low temperature HIP is preferable. The high temperature HIP introduce brittle BeFe inter metallic compounds along bonding interface. On the other hand, joint with thick chromium layer suffer from brittleness of chromium itself.