

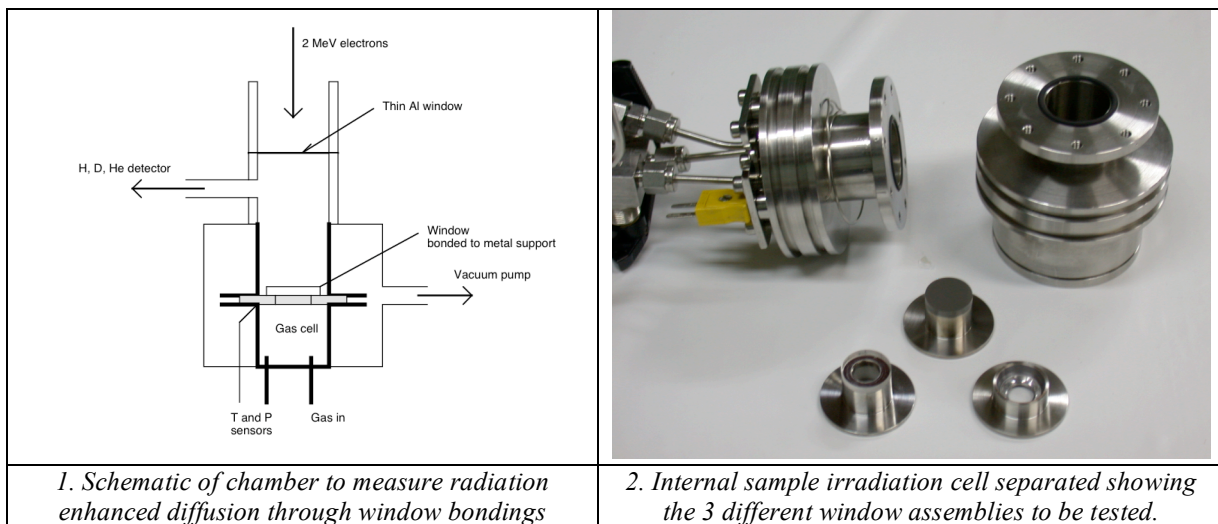
RADIATION TESTING OF DIAGNOSTIC WINDOW BONDINGS FOR ENHANCED H ISOTOPE DIFFUSION

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Windows will be required for H&CD and many diagnostics in ITER. These form not only a vacuum, but also an important tritium barrier. Recent work has shown that radiation enhanced H isotope diffusion in candidate materials (alumina, sapphire, silica, diamond, BeO, AlN) will not be a serious problem [1]. However the question remained as to the bonding region between the different window materials and flanges, not only the mechanical integrity but also the possibility of diffusion through the modified interface. Prototype diagnostic window assemblies have already been manufactured and mechanically tested [2, 3]. Here we report on the testing of simplified window assemblies using the same bonding, for radiation enhanced H isotope diffusion. Diffusion has been determined for 3 simplified windows consisting of crystal quartz with Al diffusion bond on 316 stainless steel, fused silica with Al diffusion bond on tantalum, and silicon nitride with Al diffusion bond on titanium. The different windows were mounted in a special chamber at the end of the beam line of a Van de Graaff accelerator with one window face in vacuum irradiated with 1.8 MeV electrons and the other subjected to deuterium or helium at 2000 mbar (Figs. 1, 2). Gas leakage through the window assembly was measured with a helium/hydrogen leak detector during irradiation at 200 Gy/s, ≤ 35 °C. After irradiation the gas pressure was increased to 4000 mbar to check for possible mechanical failure of the assemblies. Optical absorption was also measured before and after irradiation. The results indicate extremely low enhanced diffusion for all 3 bondings.



- [1] Radiation enhanced diffusion of hydrogen isotopes in silicas and aluminas. Deliverable 7 of TW5-TPDC-IRR CER (E.R. Hodgson and A. Moroño. Euratom - CIEMAT Association, Madrid, Spain). To be published.
- [2] Manufacture and testing of rig-sized diagnostic windows. Deliverable 1 of TW4-TPDS-DIADEV (Euratom - UKAEA Association, Culham, UK).
- [3] Radiation effects on the bondings in window assemblies: mechanical strength. Deliverable 2.1 of TW6-TPDC-IRR CER (A. Gusarov. SCK/CEN, Mol, Belgium)