

Modelling of Ion Cyclotron Wall Conditioning plasmas

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Ion Cyclotron Wall Conditioning (ICWC) is envisioned in ITER to clean the wall from impurities, to control the wall isotopic ratio and the hydrogen recycling in the presence of the toroidal magnetic field. Various experiments and modelling are advancing to consolidate this technique.

In this contribution the modeling of ICWC is presented, which can be divided in three parts: plasma description, plasma wall interaction and RF power deposition. Firstly a 0D plasma model, based on a set of energy and particle balance equations for Maxwellian Hydrogen and Helium species, is presented. The model takes into account elementary collision processes, coupled RF power, particle confinement, wall recycling, and active gas injection and pumping. The RF plasma production process is based mainly on electron collisional ionization. The dependency of the plasma parameters, the Hydrogen and Helium partial pressures and neutral or ionic fluxes on pressure and RF power are quantitatively in good agreement with those obtained experimentally on TORE SUPRA. Secondly an extension of the 0D model including the description of the wall interaction is presented and compared to TORE SUPRA multi-pulse ICWC discharges. Finally the basis for developing a self consistent model including RF power deposition properties is discussed.