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Physics and modeling of ITER glow discharge cleaning[1] G.J.M. HAGELAAR, LAPLACE, CNRS and University of Toulouse, France, D. KOGUT, D. DOUAI, CEA, IRFM, Association Euratom-CEA, France, R.A. PITTS, ITER Organization — Glow discharge cleaning (GDC) is a common technique for the conditioning of tokamak vessel walls in order to improve the tokamak plasma performance and reproducibility. The GDC discharge is a dc low-temperature plasma discharge, operated when the tokamak magnetic fields are off, between several anodes inserted into the vessel, and the vessel walls serving as a cathode. The plasma is sustained by fast electrons emitted from the walls by ion impact, accelerated through a thin cathode sheath up to nearly the discharge voltage, and then penetrating very far into the plasma. On the other hand, the electric potential in the plasma bulk, which determines the wall ion flux distribution, seems to be controlled by low-energy bulk electrons. This paper presents a self-consistent 2D model of the GDC discharge with the aim to improve fundamental understanding and predict the wall current density distribution as input to the ITER GDC system design. The model is based on a hybrid approach, combining a fluid model of the plasma bulk with a Monte-Carlo simulation of the fast electrons. Comparisons are shown with experimental results obtained on a small scale test stand.

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