Interpreting the dynamic equilibrium during evaporation in a cesium environment

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Abstract:The cesium ovens for the prototype source of the ITER neutral beam injectors are currently tested in the CAesium Test Stand (CATS) facility, with a background pressure of 10−6mbar. Different diagnostics are here installed: two Langmuir–Taylor detectors allow us to determine the Cs vapour evaporation rate from the oven and the Cs density at different positions in the vacuum chamber; and laser absorption spectroscopy is used to measure the density integrated over a line of sight and a quartz crystal microbalance to detect the cesium mass deposited in time over a surface. In this paper, we present a model to describe the dynamic equilibrium in the evaporation chamber of CATS with the first oven tested in order to gain information about the Cs sticking coefficient at the walls. The model hence includes sticking and energy accommodation of the Cs atoms to the walls, calculates the flux density at the surfaces, and provides the Cs atom density at any location in the volume. By this model, we simulate the Cs evaporation and the equilibrium density, comparing the modeled results with the experimental data. As a result, a sticking coefficient of 2% is obtained.