O-3

**Improved material mixing model in ERO2.0: nonlinear effect of boron concentration on tungsten sputtering and influx from mixed tungsten-boron surfaces**

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SDTrimSP [1] simulations indicate that incorporating a low-Z material, such as B, into a W surface reduces the surface binding energy and the impact energy threshold for W sputtering. For D projectiles, a surface mix of 90% W and 10% B results in a more than doubled W sputtering rate compared to a pure-W surface at impact energies below 270 eV. However, the W sputtering rate at impact energies above 600 eV decreases with increasing B due to a reduced W concentration. Increasing the B surface concentration also increases the initial energy of the sputtered B and W atoms by up to 30% due to weaker surface binding.

The material mixing model [2] in the ERO2.0 [3] code has been upgraded such that the sputtering and reflection yields for each particle species are no longer linearly interpolated from pure-material SDTrimSP yields, but include nonlinear effects of the surface concentration. A database of sputtering yields and energy-angular distributions of the sputtered particles has been compiled from new SDTrimSP simulations for surface material combinations of W mixed with D, Be, or B. The studied projectile species include H, D, T, He, Be, B, Ne, Ar, and W. The energy and angular distributions of particles sputtered from the mixed-material surfaces are described in ERO2.0 using parametrized analytic expressions fitted to SDTrimSP data. These analytic expressions are more robust to statistical noise than tabulated data, particularly for low sputtering yields during detached divertor operation.

The first ERO2.0 simulations using the mixed-material sputtering yields in validated tokamak plasma conditions predict that adding, as an example, a 10% boron surface concentration to the JET W divertor components would increase the total W influx into the confined plasma by 6% in attached L-mode and by 2% in a type-I ELMy H-mode scenario, assuming the incident particle fluxes on surfaces remain unchanged.

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