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Secondary electron emission yield from surface-architected materials

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The plasma electrons bombarding a plasma-facing wall surface can induce secondary electron emission (SEE) from the wall. A strong SEE can enhance the power losses by reducing the wall sheath potential and thereby increasing the electron flux from the plasma to the wall. The use of the materials with surface roughness and the engineered materials with surface architecture is known to reduce the effective SEE by trapping the secondary electrons. In this work, we demonstrate a 65% reduction of SEE yield using a velvet material consisting of high aspect ratio carbon fibers. The measurements of SEE yield for different velvet samples using the electron beam in vacuum demonstrate the dependence of the SEE yield on the fiber length and the packing density, which is strongly affected by the alignment of long velvet fibers with respect to the electron beam impinging on the velvet sample.

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