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Dynamic Fractal TRIDYN: Modeling Surface Morphology and Composition Evolution under Ion Bombardment[1] JON DROBNY, ALYSSA HAYES, DAVID RUZIC, University of Illinois at Urbana-Champaign — Fractal TRIDYN (FTRIDYN) is an upgraded version of the Monte-Carlo, Binary Collision Approximation (BCA) code TRIDYN that includes an explicit, dynamically evolving fractal model of surface roughness in addition to the dynamic composition model included in standard TRIDYN. The complete effect of surface roughness on plasma-material interactions, especially the time-resolved dynamics of surfaces under ion bombardment, is not fully understood. Presented is a version of FTRIDYN that includes new algorithms for handling the evolution of fractal surfaces. Fractals provide a consistent and physically realistic method to model rough surfaces using fractal dimension as a single input parameter that correlates with roughness. Particularly, a new algorithm for measuring the fractal dimension of noisy surfaces and capturing complicated surface morphology has been designed and utilized for this purpose. This allows for the simulation of a surface that evolves simultaneously in both surface composition and morphology, opening up the possibility of exploring these phenomena together. Simulations for proposed Plasma-Facing Components (PFCs) for fusion reactors, Beryllium and Tungsten, as well as for Argon incident on Silicon, are presented in this study.

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