POD006

Multiscale simulation of multicathode reactive magnetron sputtering processes at industrial scale

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This contribution presents a novel approach to predictive simulation of DC reactive magnetron sputtering with multiple cathodes and multiple sputtered elements. It enables a prediction of reactive gas distribution, reactive gas depletion and target poisoning for each cathode separately. This model can be therefore used for optimizing coating uniformity and stoichiometry, as well as position of the reactive gas inlet(s). The presented model overcomes the “multiscale” nature of reactive magnetron sputtering, which poses a problem for efficient simulation of this process. This is achieved by segregating the plasma dynamics timescales, metal vapor transport timescales and reactive gas timescales - ultimately arriving at computation times of approximately one day for a fully loaded industrial chamber in 3D.

Keywords
reactive DC magnetron sputtering
plasma model
simulation and optimization
uniformity and stoichiometry prediction
target poisoning