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Multiscale modeling and experimental analysis of chemical vapor deposited aluminum films: linking reactor operating conditions with roughness evolution

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Abstract

When composition and crystallographic structure remain constant, film properties mainly depend on microstructure and surface morphology. In this case, the proper modeling of a growing film allows linking the final surface features with the operating conditions at the reactor scale which in turn enables the control of the properties of the final film. In this work, an experimentally supported coarse-grained, multiscale framework is applied for the modeling of the surface roughness of aluminum thin films processed by chemical vapor deposition from dimethylethylamine alane. The multiscale framework is developed by linking macroscopic transport phenomena based on continuum mechanics models with nanoscale surface events which are simulated stochastically. The model reproduces experimental data successfully, thus validat-

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