Feature-scale conformality of atomic layer deposition from continuum to free molecular flow: how Knudsen number influences thickness profile characteristics

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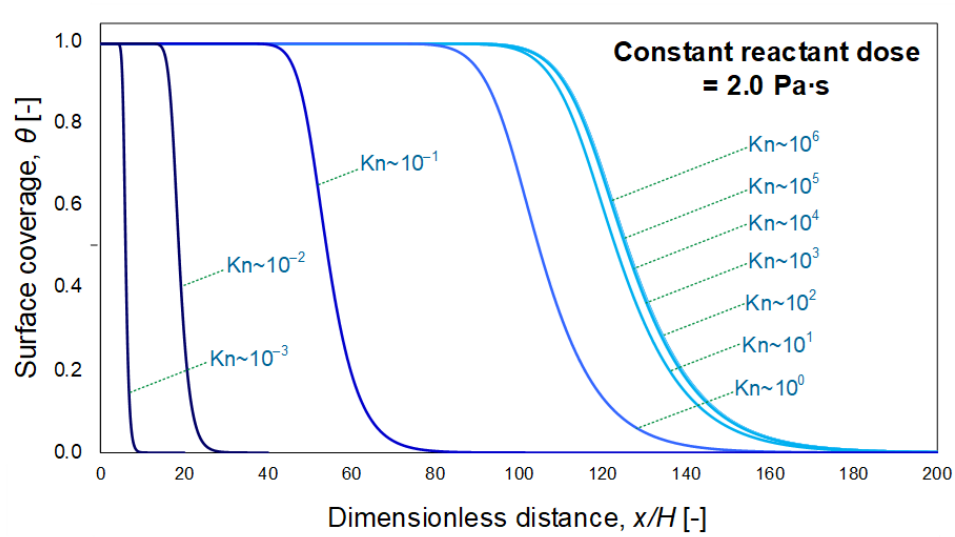

Figure 1: Surface coverage (theta) vs. dimensionless distance (x/H), simulated with the 1-dimensional diffusion-reaction model [1,2] for a constant dose (dose = $p_A t$) at different flow regimes (Knudsen numbers). Different Knudsen numbers were obtained by varying the channel height H (10^{-7} to 10^{-5} m) and initial partial pressure of Reactant A p_{A0} (10^{-3} to 10^{5} Pa). To have the dose constant, the ALD pulse time t_1 was varied between 2×10^{3} and 2×10^{-4} s. Parameters that were kept constant: T = 250 °C, $p_I = 4\times p_{A0}$, $d_A = 5.91\times10^{-10}$ m, $d_I = 3.74\times10^{-10}$ m, M_A = 0.075 kg/mol, M_I = 0.028 kg/mol, $P_d = 10^{-5}$, $c = 10^{-2}$, $q = 4\times10^{18}$ m^{-2}, N = 1.

References

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