Supplement to "Numerical Analysis on Gas Flow Field for a Sustainable ALD Process Chamber"

The continuity and momentum equations of a steady-state compressible laminar flow field for the nitrogen gas are considered as follows.

$$\frac{\partial}{\partial x_j}\left(\rho U_j\right) = 0$$

$$\frac{\partial}{\partial x_j}\left(\rho U_j U_i\right) = -\frac{\partial P}{\partial x_i} + \frac{\partial}{\partial x_j}\left(\mu\left(\frac{\partial U_i}{\partial x_j} + \frac{\partial U_j}{\partial x_i}\right)\right) - \frac{\partial}{\partial x_i}\left(\frac{2}{3}\mu\frac{\partial U_j}{\partial x_j}\right) - \rho g \delta_{i3}$$

where ρ, U, P, μ and δ are the density, velocity, pressure and molecular viscosity of the gas, and the Kronecker delta, respectively, and the subscripts i, j=1, 2 and 3 are the tensor components.

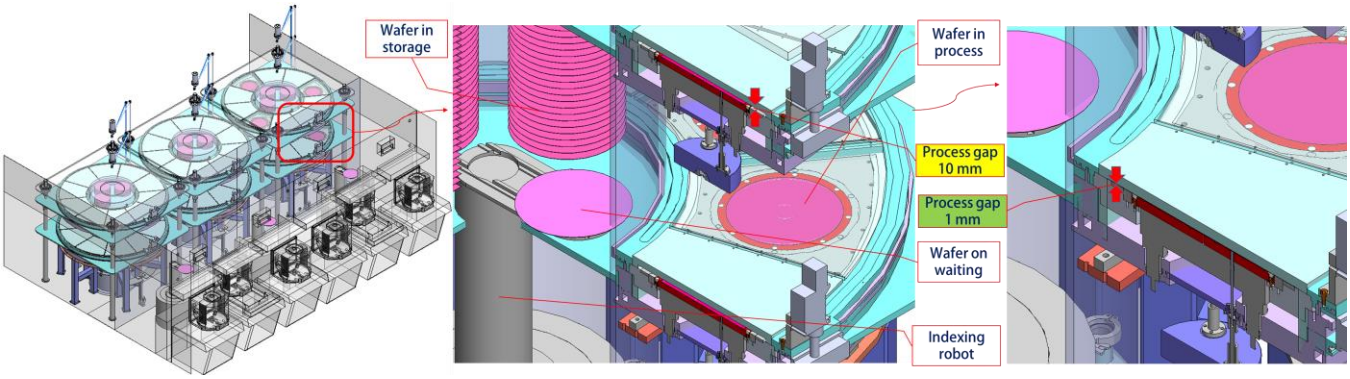

Fig. 1. Schematic diagram of the present ALD processing chamber and cluster tool for 300 mm wafers.

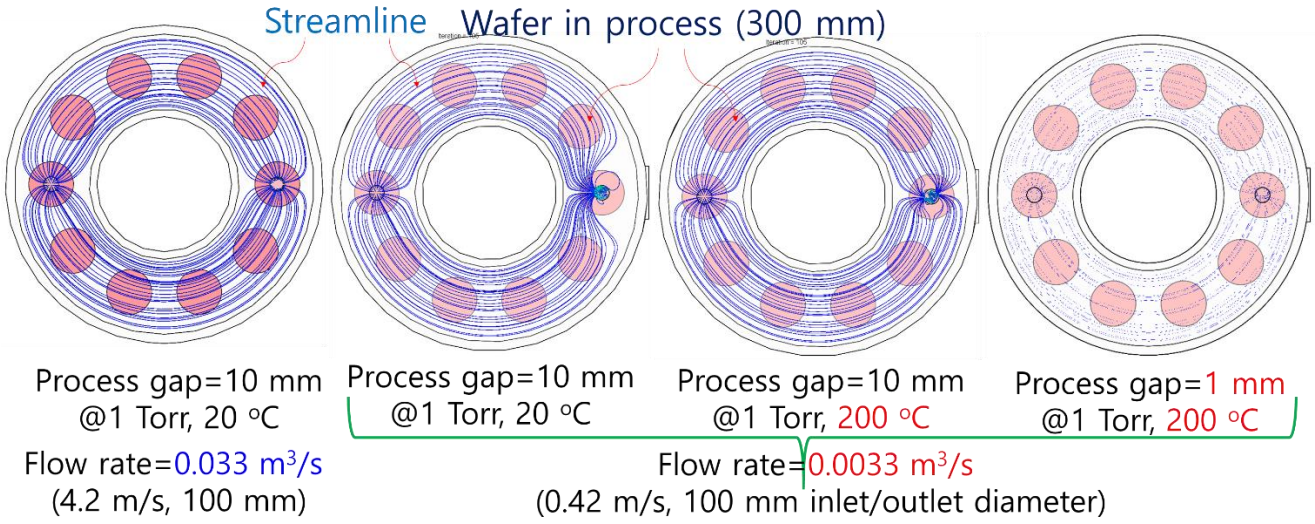

Fig. 2. Numerical results of the nitrogen gas flow fields for various operational conditions of the present ALD processing chamber.