Appendix B

B.1 Grid convergence index

For the evaluation of numerical uncertainty in the computational model grid convergence index is used to find out the % error in the discretised model, which is mentioned in the Table B.1.

Table B.1: Calculation of discretization error

Φ = Euler number			
N_1, N_2, N_3	643873, 638873, 608873	Φ_{exit}^{21}	49.95
r_{21}	1.012	e_a^{21}	0.0303
r_{32}	1.02	e_{exit}^{21}	0.009031
Φ_1	49.5	GCI_{fine}^{21}	1.139%
Φ_2	48	Φ_{exit}^{32}	48.69
Φ_3	46.8	e_a^{32}	0.025
p	124.5	e_{exit}^{32}	0.01416
		GCI_{fine}^{32}	1.796%

$$p = \frac{1}{ln(r_{21})}\left|ln\left|\frac{\varepsilon_{32}}{\varepsilon_{21}}\right| + q(p)\right|,\ q(p) = \ln\left(\frac{r_{21}-s}{r_{32}-s}\right),\ s = 1.sgn\left(\frac{\varepsilon_{32}}{\varepsilon_{21}}\right), \phi_{exit}^{21} = \left(\frac{r_{21}^{p}\phi_1-\phi_2}{r_{21}^{p}-1}\right)$$

$$e_a^{21} = \left|\frac{(\phi_1-\phi_2)}{\phi_1}\right|,\ e_{exit}^{21} = \left|\frac{\phi_{exit}^{21}-\phi_1}{\phi_{exit}^{21}}\right|,\ GCI_{fine}^{21} = \frac{1.25\ e_a^{21}}{r_{21}^{p}-1}$$

where, *N* represents the total number of cells for square honeycomb substrate of 5 mm thickness, *r* represents the refinement factor, *p* represents the apparent order, ϕ_{exit} shows the extrapolation value, e_a is for approximate relative error, e_{exit} shows the extrapolated relative error and GCI_{fine} is for fine grid convergence index. The numerical uncertainty of fine grid solution for average Euler number is calculated as $GCI_{fine}^{32} = 1.796\%$ for number of cells *638873*. On further refining the grid, $GCI_{fine}^{21} = 1.139\%$ for number of cells *643873*.