Agglomeration solver Cell Average

General description

Performs calculation of the agglomeration process in form of birth $B_{agg}(n,v,t)$ and death $D_{agg}(n,v,t)$ terms using a cell average technique:

$$\frac{\partial n(v,t)}{\partial t} = B_{agg}(n,v,t) - D_{agg}(n,v,t),$$

$$B_{agg}(n,v,t) = \frac{1}{2}\beta_0 \int_0^v \beta(u,v-u)n(u,t)n(v-u,t)du,$$

$$D_{agg}(n,v,t) = \beta_0 n(v,t) \int_0^\infty \beta(u,v)n(u,t)du$$

- v and u are volumes of agglomerating particles
- $n(v,t)$ is the number density function
- $B_{agg}(n,v,t)$ and $D_{agg}(n,v,t)$ are the birth and death rates of particles with volume v caused due to agglomeration
- β_0 is the agglomeration rate constant, dependent on operating conditions but independent from particle sizes
- $\beta(v,u)$ is the agglomeration kernel describing the agglomeration frequency between particles of volumes v and u, which produce a new particle with the size $(v + u)$
- t is time

Requirements

- Solid phase
- Particle size distribution
- Equidistant volume grid for particle size distribution

References

J. Kumar, M. Peglow, G. Warnecke, S. Heinrich, An efficient numerical technique for solving population balance equation involving aggregation, breakage, growth and nucleation, Powder Technology 182 (1) (2008) 81-104.