

Mass conserving global solutions for the nonlinear collision-induced fragmentation model with a singular kernel

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Abstract

This article is devoted to the study of existence of a mass conserving global solution for the collision-induced nonlinear fragmentation model which arises in particulate processes, with the following type of collision kernel: $C(x,y) \leq k_1 \frac{(1+x)^\nu (1+y)^\nu}{\left(xy\right)^\sigma}$, for all $x, y \in (0, \infty)$, where k_1 is a positive constant, $\sigma \in \left[0, \frac{1}{2}\right]$ and $\nu \in [0, 1]$. The above-mentioned form includes many practical oriented kernels of both **singular** and **non-singular** types. The singularity of the unbounded collision kernel at coordinate axes extends the previous existence result of Paul and Kumar [Mathematical Methods in the Applied Sciences 41 (7) (2018) 2715–2732 (<https://doi.org/10.1002/mma.4775>)] and also exhibits at most quadratic growth at infinity. Finally, uniqueness of solution is also investigated for pure singular collision rate, i.e., for $\nu=0$.

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