

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

Debdulal Ghosh¹, Jayanta Paul¹, and Jitendra Kumar¹

¹Indian Institute of Technology Kharagpur

January 31, 2022

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, $\sigma \in [0, \frac{1}{2}]$ 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 $\nu=0$.

Hosted file

Collisional_singular.pdf available at <https://authorea.com/users/424877/articles/554772-mass-conserving-global-solutions-for-the-nonlinear-collision-induced-fragmentation-model-with-a-singular-kernel>