

A Finite-Discrete Element Model for Simulating Collision and Fragmentation of Nanoparticle Agglomerates

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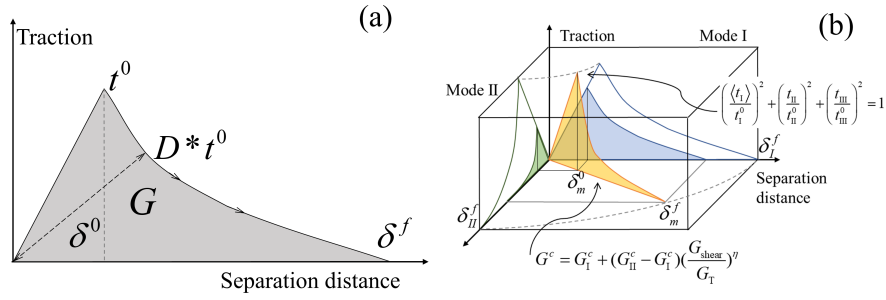
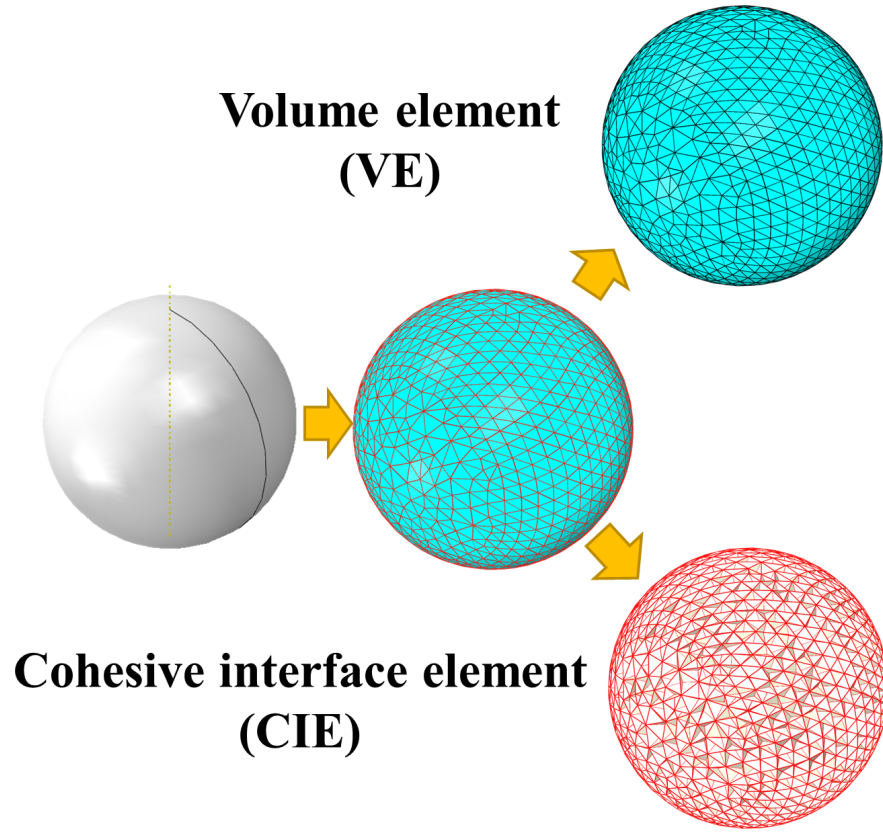
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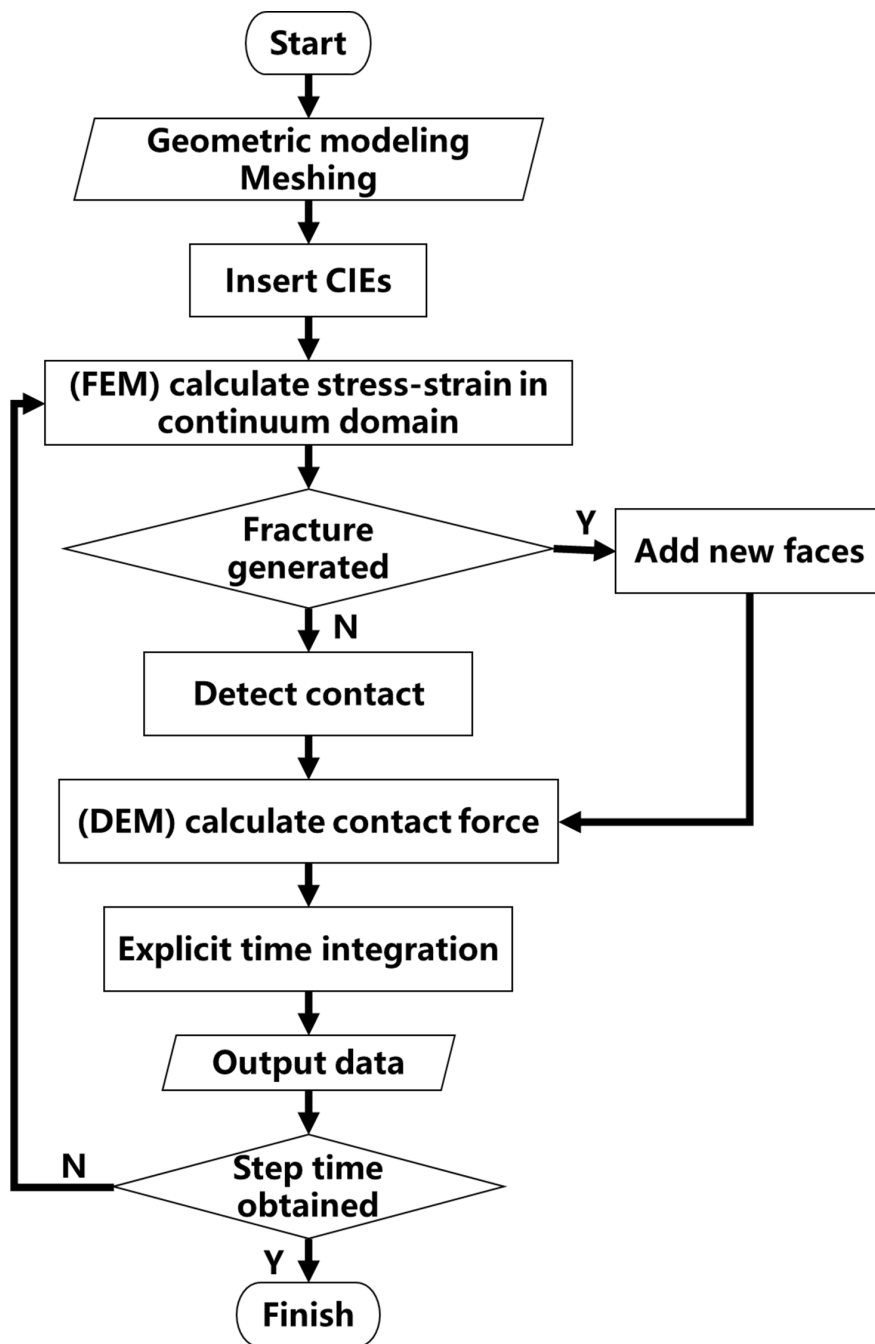
Abstract

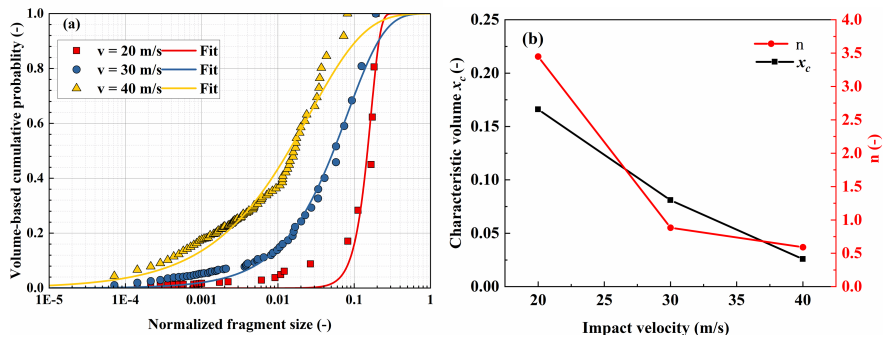
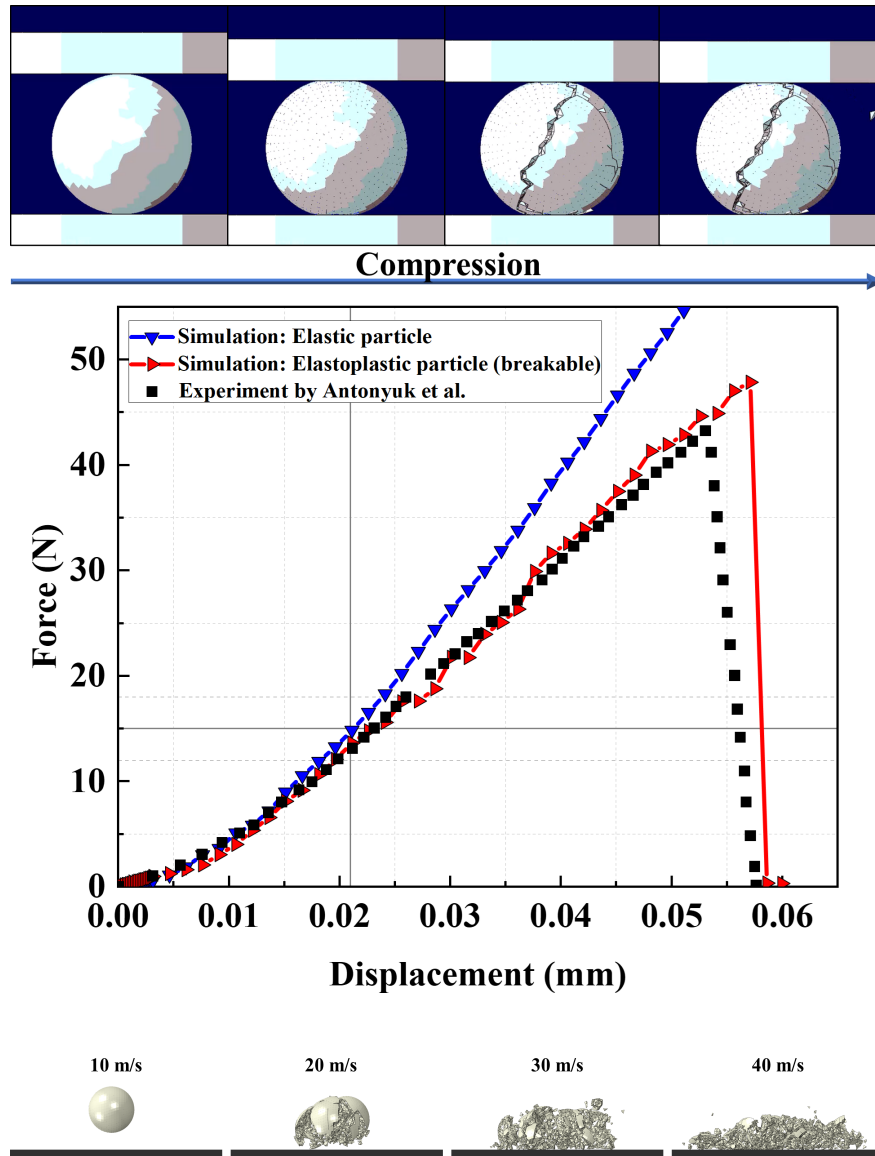
The fragmentation/adhesion behavior of nanoparticle agglomerate collision, which is challenging to model, is a crucial factor affecting fluidization. In this study, a discrete-finite element method (FDEM) based cohesive crack model is developed to simulate normal collisions between a complex agglomerate (around 1 mm) and a wall. In the FDEM model, the complex agglomerate is built from primary agglomerates (around a few micrometers), whose adhesive force and Young's modulus are measured by an atomic force microscope (AFM). Simulation results agree well with the collision experiments. Furthermore, the effects of adhesive force, solid holdup and Young's modulus on fragmentation behavior are explored, and a two-parameter Weibull function is found to fit well with the fragment distribution. The current FDEM model provides a link between the collision behavior and agglomerate properties. The detailed fragmentation/adhesion information can be useful for developing a macro model for agglomerate collision in the future.

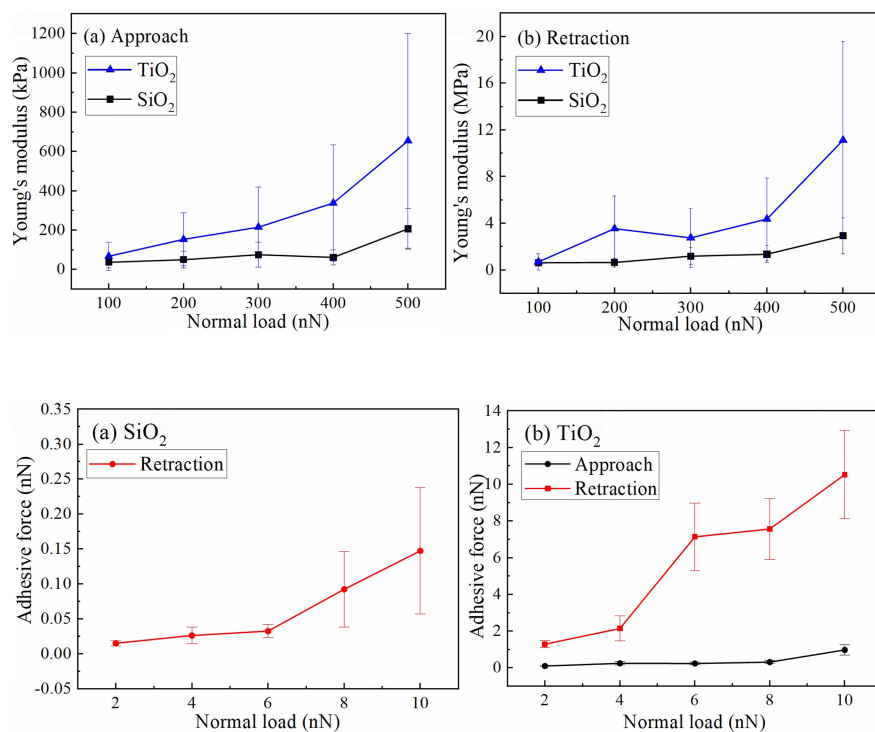
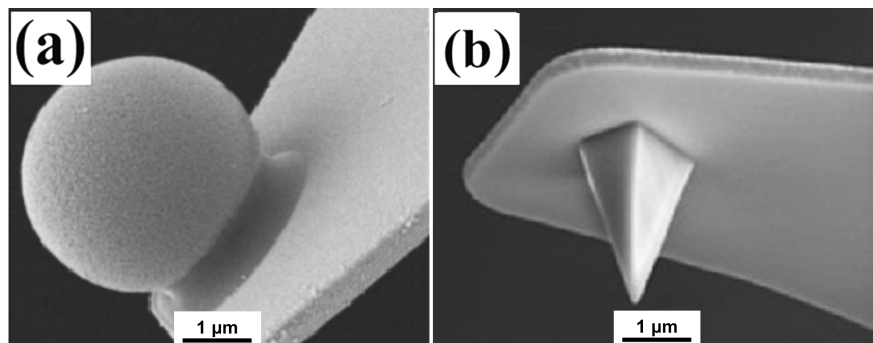
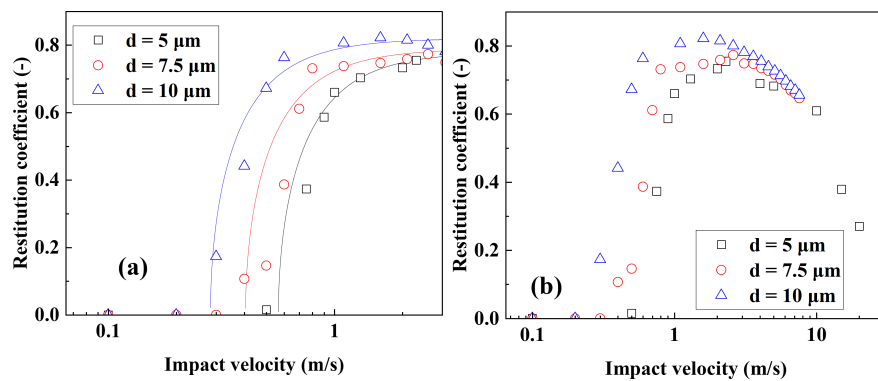
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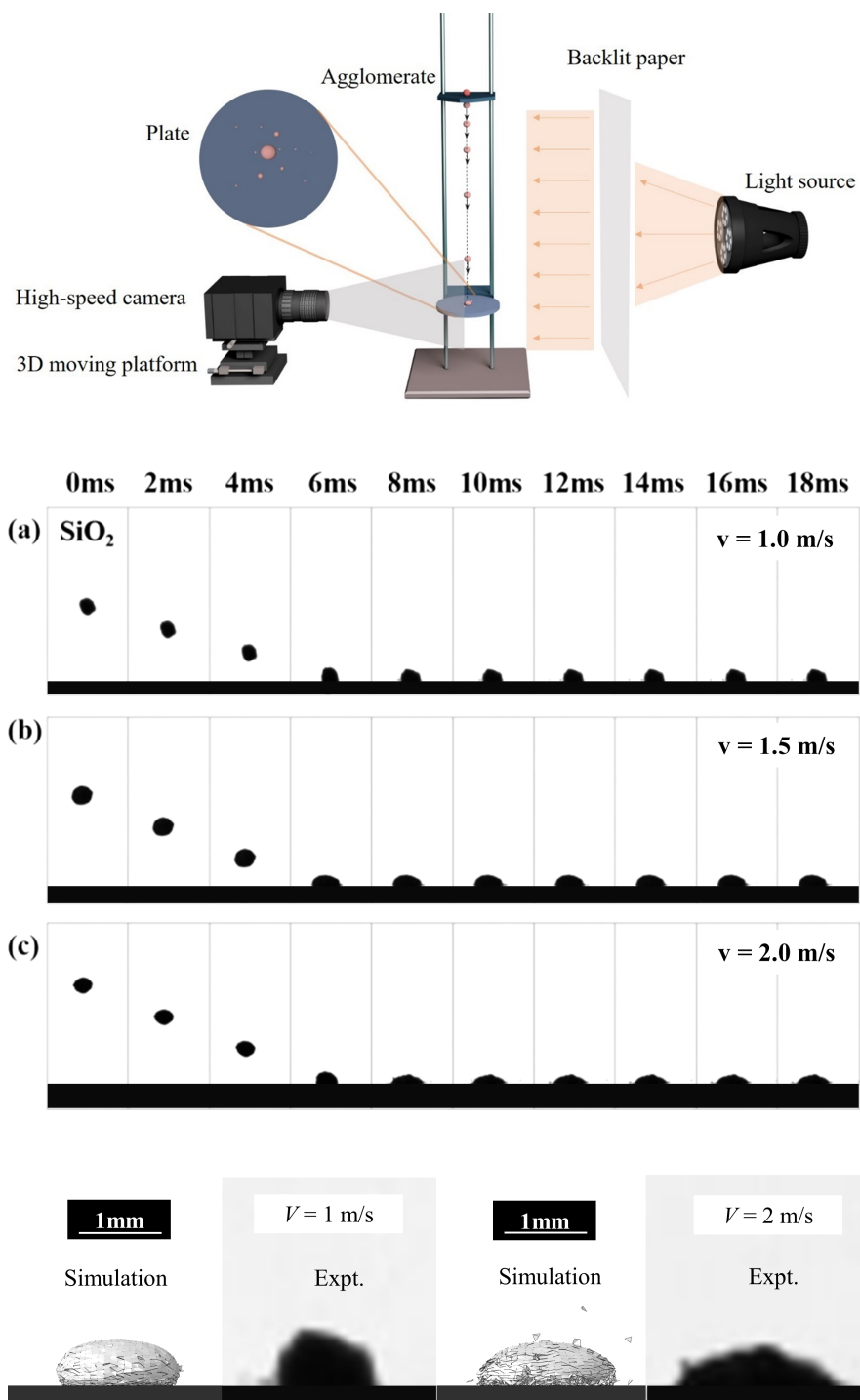
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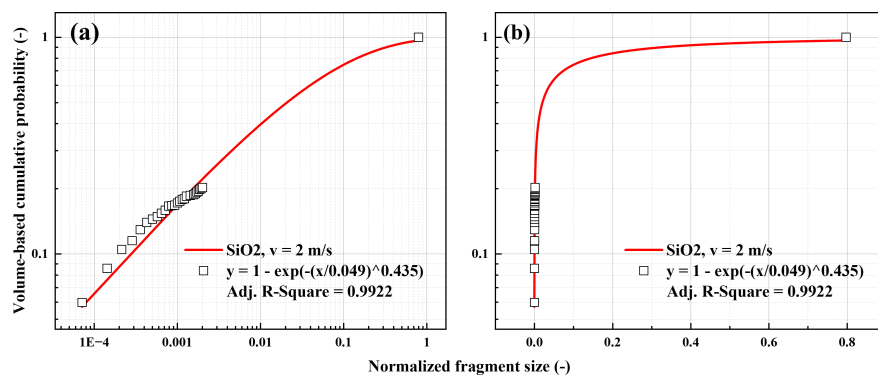
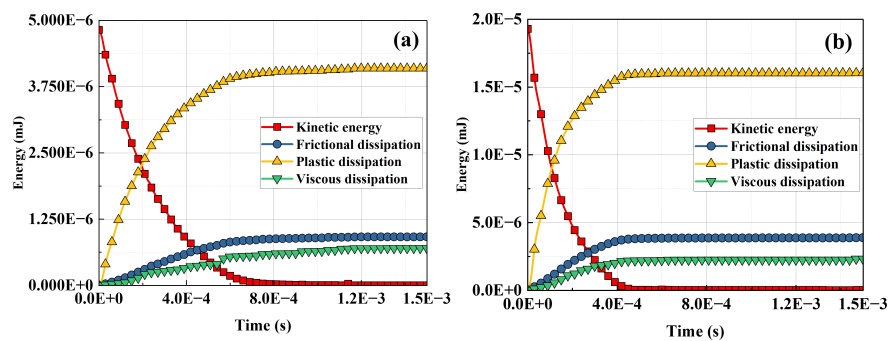
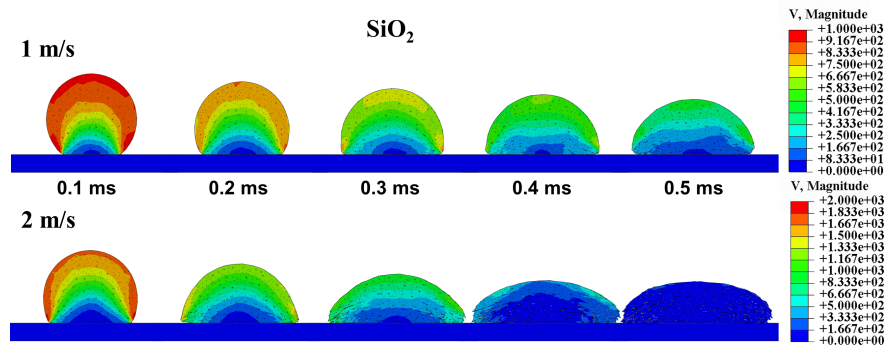


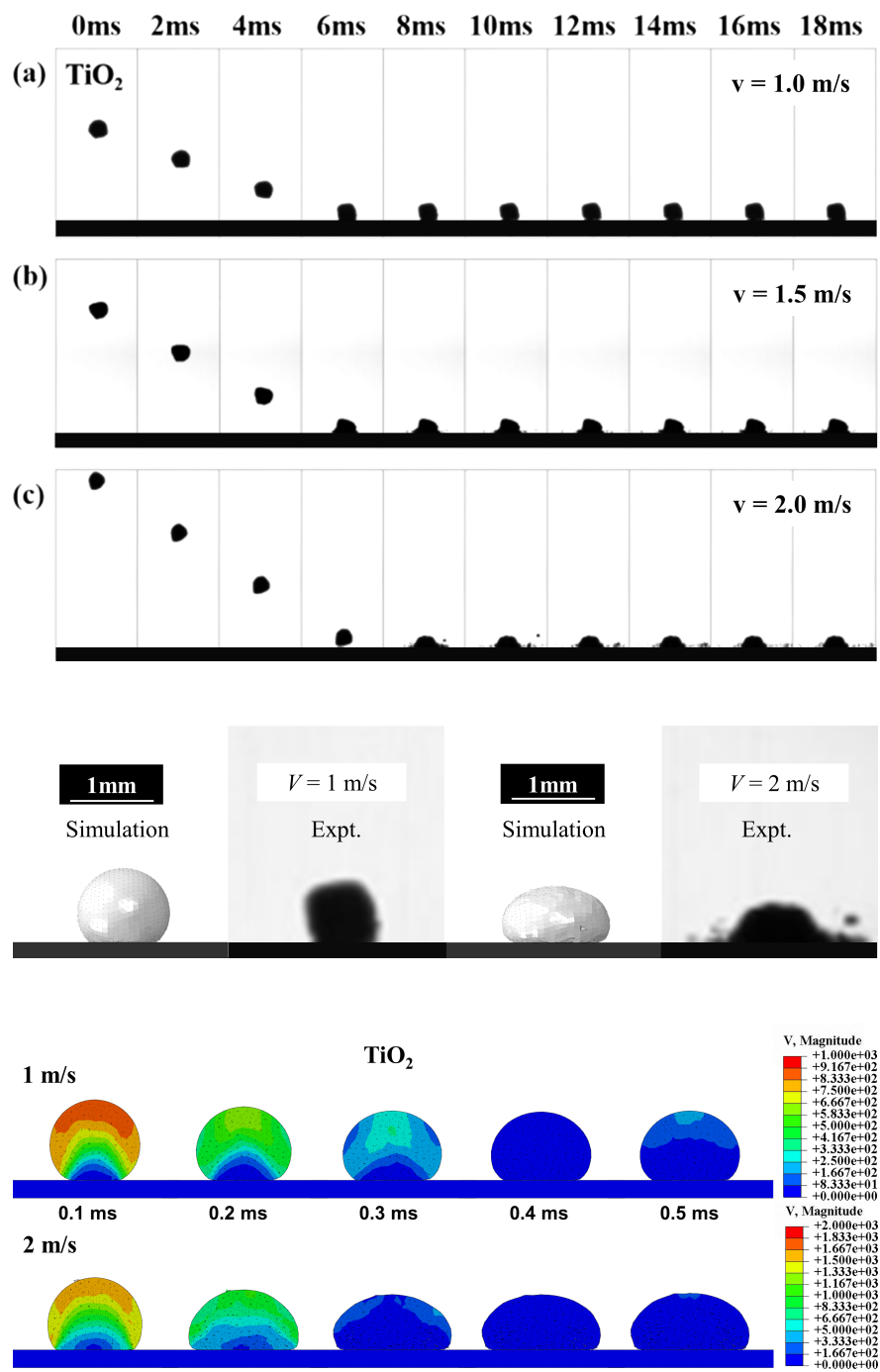


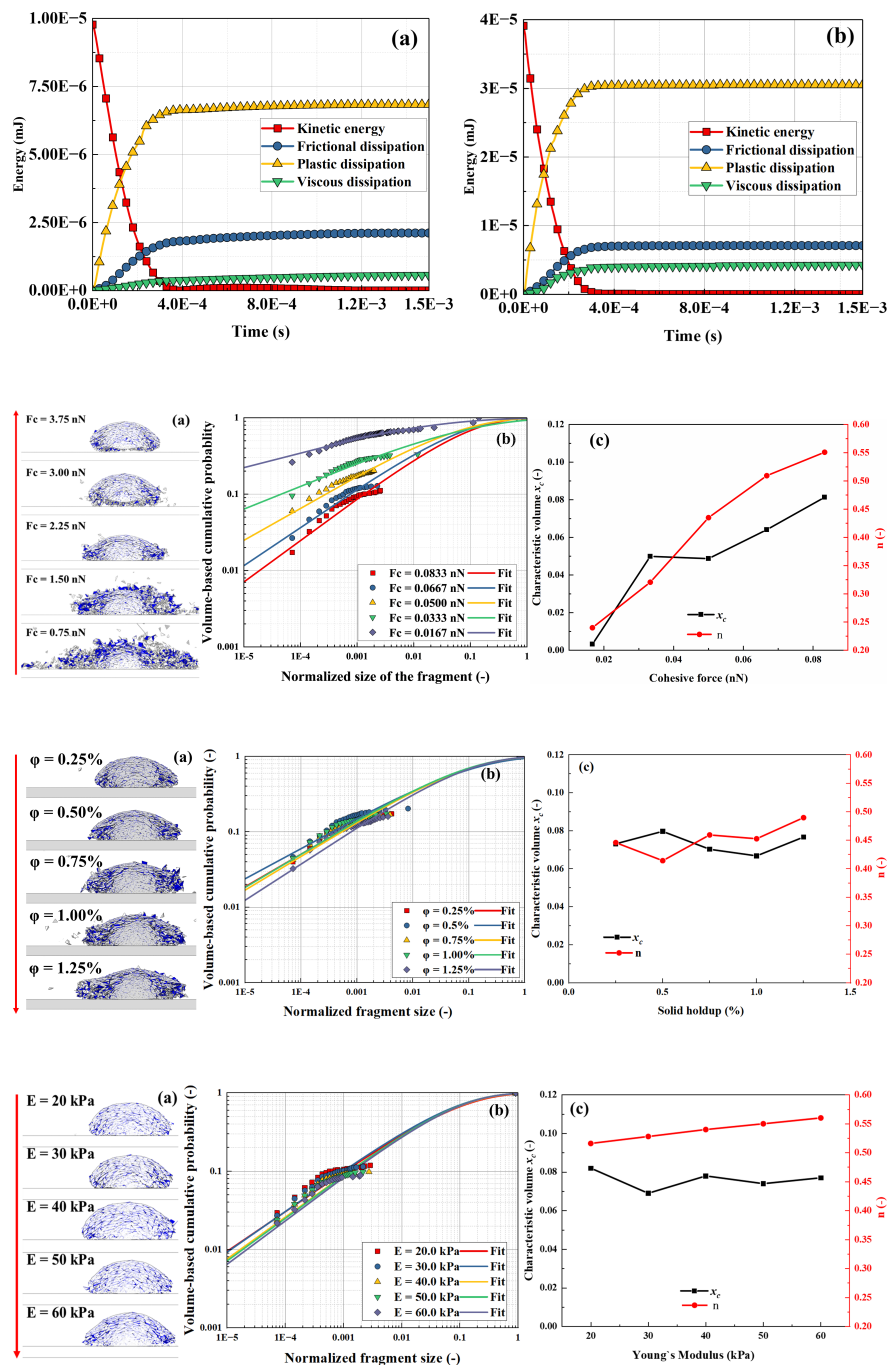


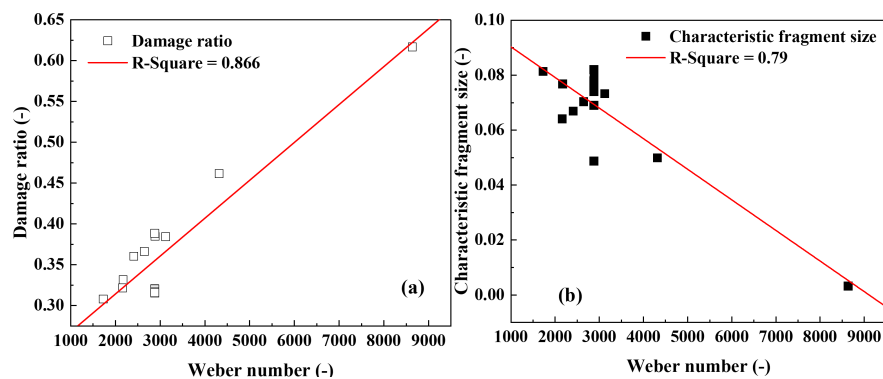












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