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Micromechanical Coupling of Irregular Particles and Fluid

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Exploring the complex interplay between granular materials and accompanying fluids is an intricate problem, as their morphological properties add layers of complexity to the interplay of inertial, viscous, frictional, and elastic forces, which can make modeling such systems difficult. Here, we introduce a novel coupled framework designed to study the impact of particle morphology on granular particle dynamics. Our micro-mechanical model sheds light on the mechanical behavior, revealing significant influences from particle morphology. Interestingly, the presence of fluid mitigates movement differences induced by particle shape. Demonstrating these insights through a collapse process, we observe that the fluid's viscous and lubrication effects distinctly hinder and enhance dislocation, respectively. Notably, the dominance of fluid lubrication intensifies with increasing irregularity in particle shapes.

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