

Abstract Submitted
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Numerical investigation into the role of fluid dynamics in a novel device for graphene exfoliation.¹ USMAAN FAROOQ, Imperial College London, JASON STAFFORD, University of Birmingham, CAMILLE PETIT, OMAR MATAR, Imperial College London — In this study a novel experimental rig is used to perform liquid phase exfoliation of graphite in order to produce graphene. During this process, graphite particles are exposed to high shear rates, forming few-layer materials through processes such as peeling and fragmentation. The rig is comprised of two concentric cylinders, the inner of which is rotating. Through this design, two distinct flow regimes are present, the well-studied Taylor-Couette flow in the narrow gap between the cylinders, and a rotating film domain within the hollow inner cylinder. Each of these domains is studied using numerical simulations, including LES of the Taylor-Couette flow and DNS of the rotating film. Through this approach, strain maps can be constructed in each case, allowing one to identify the extent and location of exfoliation. Further factors such as the impact of the peristaltic pump and residence time are also taken into account in order to determine the ideal operating points for graphene production.

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