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Optimisation of Graphene Production via Liquid Phase Exfoliation[1] JASON STAFFORD, University of Birmingham, USMAAN FAROOQ, NWACHUKWU UZO, CAMILLE PETIT, OMAR MATAR, Imperial College London — Graphite particles dispersed in a solvent can be exposed to high shear stresses in order to produce graphene in a process called liquid phase exfoliation. Shear stress is commonly understood to be the leading 'parameter, as it overcomes the van der Waals interlayer force and leads to exfoliation. By studying two exfoliation processes with different hydrodynamics, however, it has become apparent that both shear stress *and* particle residence time play important roles in production output. In one setup, a thin film flowing over a spinning disc, increasing the rotational speed and/or flow rate leads to an increased radial velocity, thereby directly reducing the amount of time the particles were exposed to the shear. In the second setup, based around Taylor-Couette flow, the influence of both the pump speed and rotational speed of the cylinder have a significant effect on the resultant graphene production rate. Detailed experimental and CFD studies, including DNS of the rapidly rotating thin films and LES of the Taylor-Couette flow, were performed in order to investigate the underlying mechanisms associated with exfoliation and determine the optimal operating points.

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Omar Matar
Imperial College London

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