

# Well-posedness of the Navier-Stokes Phase-Field Crystal Model

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The Navier-Stokes Phase-Field Crystal model [1] is a sixth-order non-linear parabolic system of partial differential equations describing the evolution of a colloidal suspension, which can be thought of as a mixture consisting of solid crystal particles continuously immersed within a fluid. The solid particles are assumed to be a highly viscous fluid and so we are working in the domain of two-phase flow. In this masters project, we define the notion of a weak solution for our system and prove its global existence. Additionally, we prove that such a solution is unique in the two-dimensional case.

[1] S. Praetorius and A. Voigt, *A Navier-Stokes Phase-Field Crystal model for colloidal suspensions*, The Journal of Chemical Physics, Vol. 142, 15, 2015.