Finite dimensional reduction and convergence to equilibrium for incompressible Smectic-A liquid crystal flows

Antonio Segatti, Hao Wu

(Submitted on 1 Nov 2010)

We consider a hydrodynamic system that models the Smectic-A liquid crystal flow. The model consists of the Navier-Stokes equation for the fluid velocity coupled with a fourth-order equation for the layer variable $\vp$, endowed with periodic boundary conditions. We analyze the long-time behavior of the solutions within the theory of infinite-dimensional dissipative dynamical systems. We first prove that in 2D, the problem possesses a global attractor $\mathcal{A}$ in certain phase space. Then we establish the existence of an exponential attractor $\mathcal{M}$ which entails that the global attractor $\mathcal{A}$ has finite fractal dimension. Moreover, we show that each trajectory converges to a single equilibrium by means of a suitable Lojasiewicz--Simon inequality. Corresponding results in 3D are also discussed.

Subjects:	**Analysis of PDEs (math.AP)**
MSC classes:	35B41, 35Q35, 76A15, 76D05
Cite as:	**arXiv:1011.0358v1 [math.AP]**

Submission history

From: Antonio Segatti [view email]

[v1] Mon, 1 Nov 2010 15:51:45 GMT (34kb)