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Strong solutions to a modified Michelson-Sivashinsky equation. (English) Zbl 1479.35225
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Summary: We prove a global well-posedness and regularity result of strong solutions to a slightly modified Michelson-Sivashinsky equation in any spatial dimension and in the absence of physical boundaries. Local-in-time well-posedness (and regularity) in the space $W^{1,\infty}(\mathbb{R}^d)$ is established and is shown to be global if in addition the initial data is either periodic or vanishes at infinity. The proof of the latter result utilizes ideas previously introduced by Kiselev, Nazarov, Volberg and Shterenberg to handle the critically dissipative surface quasi-geostrophic equation and the critically dissipative fractional Burgers equation. Namely, the global regularity result is achieved by constructing a time-dependent modulus of continuity that must be obeyed by the solution of the initial-value problem for all time, preventing blowup of the gradient of the solution. This work provides an example where regularity is shown to persist even when *a priori* bounds are not available.

MSC:

- [35D35](#) Strong solutions to PDEs
- [35B50](#) Maximum principles in context of PDEs
- [35B65](#) Smoothness and regularity of solutions to PDEs
- [35K15](#) Initial value problems for second-order parabolic equations
- [35K58](#) Semilinear parabolic equations
- [35R11](#) Fractional partial differential equations

Cited in 1 Document

Keywords:

global regularity; Michelson-Sivashinsky; nonlinear-nonlocal parabolic equation

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