Search or Article-id

(Help | Advanced search)

All papers | Go!

Nonlinear Sciences > Chaotic Dynamics

Laplacian Growth II: Saffman - Taylor Problem without surface tension in Filtration Combustion: Formation of one finger with half of the channel width

Oleg Kupervasser

(Submitted on 4 Jun 2011 (v1), last revised 10 Jul 2012 (this version, v3))

Filtration combustion is described by Laplacian growth without surface tension. These equations have nice analytical solutions which replace its complex integro-differential motion equations by simple differential equations of poles motion in a complex plane. The main problem of such solution is existing finite time singularities. To prevent such singularities nonzero surface tension is usually used. But such nonzero surface tension does not exist in filtration combustion and destroys analytical solutions. However more elegant way exists to solve the problem. First of all, we can introduce some small poles noise to system. Secondary, for regularization of problem we throw out all new poles that can give finite time singularity. It can be strictly proved that asymptotic solution for such system is a single finger. Moreover the qualitative consideration demonstrate that finger with 1/2 of the channel width is statistically stable. So all properties of such solution are completely the same as for the solution with a nonzero surface tension under a numerical noise. The solution of ST problem without surface tension are similar to the solution for equation of cellular flames in the case of combustion of gas mixtures.

Comments:	16 pages, 3 figures
Subjects:	**Chaotic Dynamics (nlin.CD)**; Pattern Formation and Solitons (nlin.PS)
MSC classes:	37C99
Cite as:	**arXiv:1106.0832v3** [nlin.CD]

Submission history

From: Oleg Kupervasser [view email]

[v1] Sat, 4 Jun 2011 15:34:20 GMT (115kb)

[v2] Thu, 18 Aug 2011 14:45:37 GMT (115kb)

Download:

- PDF
- PostScript
- Other formats

Current browse context:
nlin.CD
< prev | next >
new | recent | 1106

Change to browse by:
nlin
    nlin.PS

References & Citations

- NASA ADS

Bookmark(what is this?)

Which authors of this paper are endorsers?