A.I.

Mé Použití  pro Fyziku (na FZU)

Peter Filip

(9.11.2026)

DeepSeek Android Mobil

Case A: Co to je ?

Dotaz → A.I.



When interface between two different liquids in the vessel becomes sphaghetti-like, so narrow intrusion columns are created orthogonally to the interface, is such behaviour descibed scientifically and exolained ?

Café Latte – kávovar
23.10.2026
Zimní zahrada FZU

Přemýšlení po dobu 6 sekund >

Case A: Co to je ?



A.I.

💧 **Viscous Fingering (Saffman-Taylor Instability)**

If the two liquids have different viscosities, a less viscous fluid pushing into a more viscous one can trigger this instability. The interface destabilizes, and the low-viscosity fluid penetrates the high-viscosity fluid in the form of **finger-like columns** that grow orthogonally to the original interface. This is

Google:

Wikipedia

From Wikipedia, the free encyclopedia

The **Saffman–Taylor instability**, also known as **viscous fingering**, is the formation of patterns in a morphologically unstable interface between two fluids in a porous medium or in a Hele-Shaw cell, described mathematically by Philip Saffman and G. I. Taylor in a paper of 1958.[1][2] This situation is most often encountered during drainage processes



An example of viscous fingering

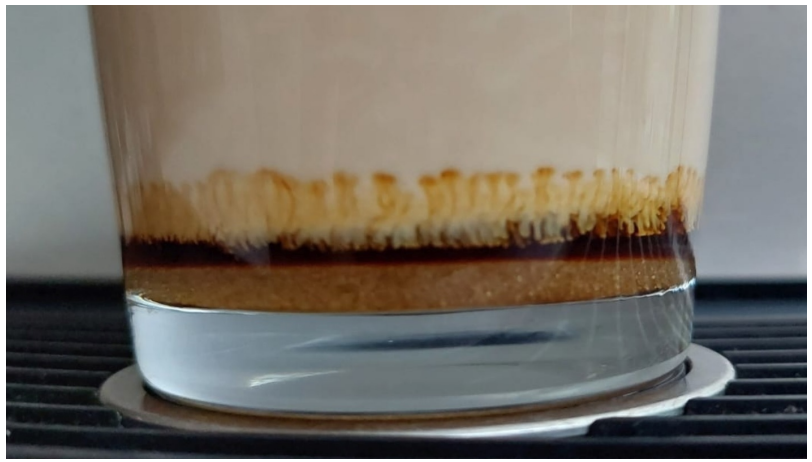
Case B: References ?

dotaz -> A.I.

Is there any publication on Saffman-Taylor instability observed in the Coffee ?

Přemýšlení po dobu 5 sekund >

Yes, there are publications that discuss this. The connection typically appears in two main contexts: research using coffee as a familiar example of the phenomenon, and



Article | Open access | Published: 12 December 2017

Laboratory layered latte

Nan Xue, Sepideh Khodaparast, ... Howard A. Stone + Show authors

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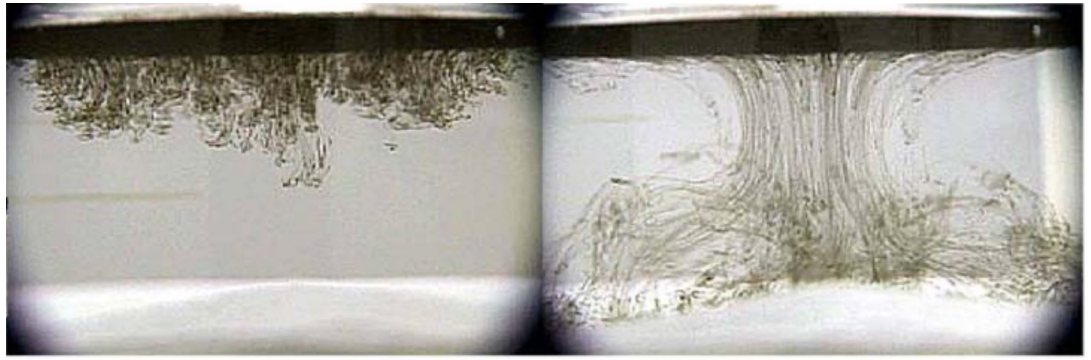
57k Accesses | **27** Citations | **315** Altmetric | Metrics

Abstract

Inducing thermal gradients in fluid systems with initial, well-defined density gradients results in the formation of distinct layered patterns, such as those observed in the ocean due to double-diffusive convection. In contrast, layered composite fluids are sometimes observed in confined systems of rather chaotic initial states, for example, lattes formed by pouring espresso into a glass of warm milk. Here, we report controlled experiments injecting a fluid into a miscible phase and show that, above a critical injection velocity, layering emerges over a time scale of minutes. We identify critical conditions to produce

Case B: Reference ?

dotaz -> A.I.



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Přemýšlení po dobu 5 sekund >

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Annihilative fractals of coffee on milk formed by Rayleigh–Taylor instability

Michiko Shimokawa and Shonosuke Ohta

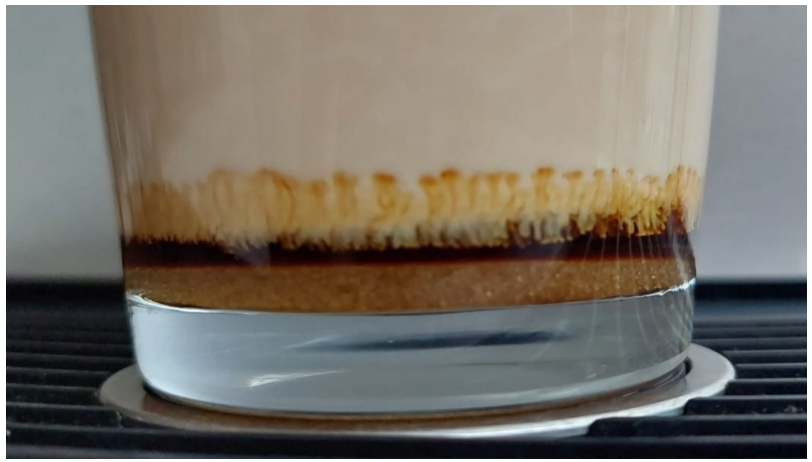
Department of Earth System Science and Technology, Kyushu University

Kasuga, Fukuoka 816-8580, Japan

https://arxiv.org/abs/0809.2458

Abstract

We have discovered a new fractal pattern, coffee exhibits on a horizontal surface, with a fractal dimension 1.88 ± 0.06, when a heavy coffee droplet interacts with the surface of



10.1016/j.ijmecsci.2017.11.008

Case C: Find my physics problem solution !

Dotaz → A.I.

Odpověď A.I.

ZrO2 white powder

Is it possible to mix ZrO2 powder with polystyrene scintillator to obtain the scintillation material with 1-2mm photon scattering length ?

Přemýšlení po dobu 75 sekund >

Assuming you mean the **optical mean free path of the scintillation light**, not the mean free path of the incoming X/γ photon: **yes, it is physically possible in principle, but it is not a simple "mix white ZrO_2 powder into polystyrene" job.** A 1–2 mm optical scattering length is a **very strongly multiple-scattering, milky/opaque regime**, not a transparent scintillator.

Case C: Find my physics problem solution !

Odpověď A.I.

🧪 Component Design

Polymer Matrix & Primary Fluorophore

- **Styrene Monomer (purified):** The base matrix, providing the fast (~2-3 ns) scintillation timing. [11]
- **Primary Fluorophore (e.g., b-PBD or PTP):** Absorbs energy from the polymer and emits in the UV. Concentration is typically around **1–2 wt%**.

Odpověď A.I.

Wavelength Shifter & Scattering Agent

- **Wavelength Shifter (e.g., POPOP):** Absorbs UV emission and re-emits in the target **420–450 nm** range. Concentration is very low, typically **0.01–0.05 wt%**.
- **Surface-Modified ZrO_2 Nanoparticles (the critical component):** To achieve 1–2 mm scattering at <3 wt%, the particles must be a **controlled Mie scatterer**. The literature indicates **~40–50 nm** is a strong candidate to reach this regime at low loading,

Case D: Give me **equations**…

Dotaz → A.I.

Can stream function be used to describe fluid flow with non-zero vorticity ?

Přemýšlení po dobu 7 sekund >

Yes, absolutely. A stream function can describe fluid flow with non-zero vorticity. In fact, it's a common tool for exactly that purpose.

Odpověď A.I.

Summary

- **2D stream function** $\psi(x, y)$ exists for any two-dimensional incompressible flow, **including those with non-zero vorticity**. Vorticity $\omega = -\nabla^2\psi$.
- **Extension to 3D**:
  - *Axisymmetric flows* (cylindrical coordinates r, θ, z) with **no swirl** ($v_\theta = 0$): a single **Stokes stream function** $\psi(r, z)$ satisfies

$$v_r = \frac{1}{r}\frac{\partial\psi}{\partial z}, \quad v_z = -\frac{1}{r}\frac{\partial\psi}{\partial r}.$$

THANKS !

any

Suggestions?