Get wet report

The edited and presented picture.

Context and Purpose

This image captures the dynamic behavior of oud incense fumes as it rises and disperses under controlled yellow lighting. The aim of this project was to visualize and analyze the movement of smoke, gaining insights into the flow patterns that emerge as the smoke interacts with ambient air and lighting.

Flow Apparatus and Phenomenon

The setup involved burning oud incense, which produces a steady stream of visible smoke. The incense was positioned beneath a kitchen exhaust hood to channel the smoke upwards. The exhaust hood created an upward airflow, influencing the smoke's trajectory. To make the picture, set up a yellow light on the top of an object, make oud incense by putting oud wood chips over an ignited grill charcoal.

The smoke rises due to its lower density and higher temperature compared to the surrounding air. Initially, the smoke exhibits smooth, laminar flow. As it ascends, it begins to mix with the ambient air, transitioning into a more chaotic, turbulent state. This shift typically occurs 15–20 cm above the incense, where the smoke starts to spread and lose its initial coherence.

To quantify the flow characteristics, I calculated the Reynolds number, using a velocity of 0.1 m/s, a characteristic length of 0.05 m, and air’s kinematic viscosity (1.5×10^{-5} m²/s):

Which resulted in a Reynolds number of Re=333. This value suggests that the flow starts predominantly laminar but transitions to turbulence as it rises and interacts with the surrounding air.

Visualization Technique

The rising smoke served as a natural flow tracer. To enhance visibility, I utilized a bright LED light installed within the kitchen exhaust hood. The light illuminated the smoke from above, creating a high-contrast effect against a plain wall background.

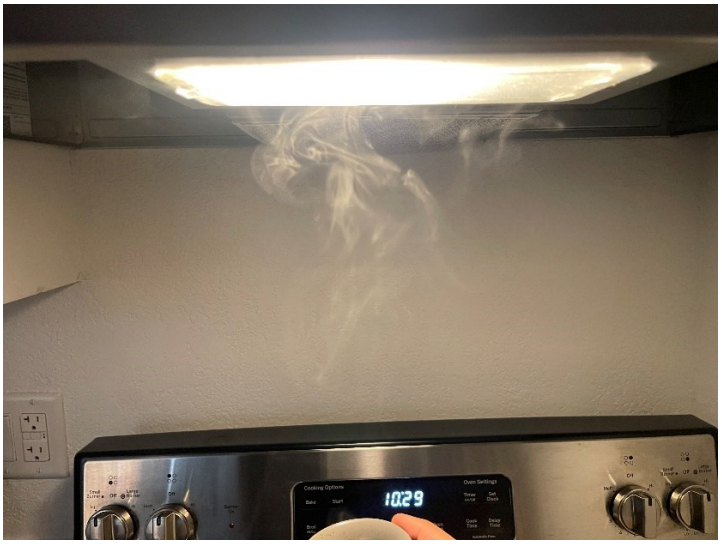
The environmental conditions were carefully maintained: a room temperature of approximately 20°C with moderate humidity and no noticeable drafts. These stable conditions ensured consistent flow behavior, allowing for more accurate observation of the smoke patterns.

Photographic Technique

The image was captured using the following photographic setup:

- **Camera**: iPhone 12 Pro
- **Lens**: Built-in wide-angle lens
- **Field of View**: Approximately 40 cm
- **Distance from Object**: 20 cm
- **Resolution**: [3024 × 4032] pixels
- **Exposure Settings**: Shutter Speed 1/60 s.

Post-processing included cropping the image from [4032 x 3024] to [3405 x 2313] cropped, changing the contrast and depth to make the fumes appear better, involving slight adjustments to brightness and contrast to enhance the smoke's visibility. No significant alterations were made to the original image.



Original uncropped image

Image Analysis and Reflection

The image effectively highlights the smoke's journey from smooth, laminar flow to more turbulent, swirling patterns. The controlled lighting successfully accentuates the delicate spirals and eddies, making the flow transition clearly observable.

Overall, I think the picture looks amazing. The image visualizes the flow patterns of the oud fumes with clarity. However, I think there is room for improvement, by adjusting the lighting angle, make a cleaner setup with a dark background, enhancing the visual quality. In future experiments, I plan to introduce additional variables, such as airflow from a fan, to observe how different conditions influence the smoke's behavior

References:

- COMSOL (2023). "Smoke from an Incense Stick Visualizing the Laminar to Turbulent Transition in Natural Convection.". https://www.comsol.com/model/smoke-from-an-incense-stick-97501.

- National Aeronautics and Space Administration (NASA) (2024). "Reynolds Number and Laminar vs. Turbulent Flow.". https://www.grc.nasa.gov/WWW/k-12/airplane/reynolds.html.