

Deep-frying sounds reveal oil temperature and the path to a perfect snack

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Tempura, schnitzel, samosas, french fries, a deep-fried stick of butter at the county fair—who doesn't love food crisped up in sizzling oil?

The delicious crunch comes from a careful balance between cooking time and oil temperature. One common household technique for making tempura, for example, is to dip moisturized chopsticks into the oil. The resulting bubbles and crackling noises help estimate how hot the oil is.

"Experienced cooks hear the temperature of the oil instead of using a thermometer," said Utah State University postdoctoral researcher Akihito Kiyama, who decided to find out what information you can glean from listening to your tempura.

Kiyama and his team from Utah State University, University of Hawai'i at Mānoa, and KAUST inserted damp chopsticks and paper into oil at varying levels of heat. A [high-speed camera](#) and microphone captured the sizzle in real time.

Their preliminary results suggest that clear acoustic signatures of oil temperature exist. The culprit is oscillating bubbles from the rapid vaporization of the moisture in the wet chopsticks or paper. The bubbles create distinct noises as the heat increases. Bubble patterns also vary dramatically depending on how close to the top oil surface they are.

"The [bubble formation](#) near or on the surface is unique and determines the sound," said Kiyama, who presents the findings at the 74th Annual Meeting of the APS Division of Fluid Dynamics. "Along the way the imagery reveals very interesting shapes, such as surface-bubble-bursting ligaments and nested cone shapes from collapsing under-oil jets within the water vapor [bubbles](#)."

More information: The preliminary test results are found [here](#).

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