Microfluidic Device Tests Fluid Compatibility

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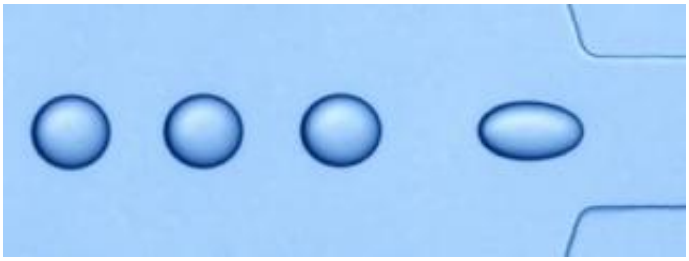

A new NIST microfluidic instrument measures the mixing compatibility of complex liquids by observing how drops of one fluid flowing within a "river" of a second fluid change in shape as they travel through channels of various sizes. Credit: Credit line: S.Hudson/NIST

The key to a great party is inviting guests who mix well and don't instill tension among their fellow revelers. The key to a great detergent, cosmetic, paint or other complex liquid product is pretty much the same--include components that mix well and don't have high levels of what scientists call "interfacial tension," a tendency to bead up and pull away from each other.

To help industrial engineers improve their ability to systematically test new product formulations, researchers at the National Institute of Standards and Technology (NIST) have developed a microfluidic instrument that quickly measures interfacial tension.

The instrument is relatively simple and includes a series of channels ranging from 700 micrometers to 50 micrometers wide. Fluids are pumped toward a "T" intersection where drops of one liquid are pinched off and flow along a "river" of the second liquid. As the spherical drops flow through constriction points in the channel, they speed up and elongate. The degree to which the drops stretch out depends on the interfacial tension between the two fluids. High levels of tension exert more pressure on the drops, keeping them more nearly spherical.

Just as the mood of a party goes through stages, the tension between newly mixed liquids can change over time, and the device tracks these changes as the drops move downstream through the channel. A camera captures 100 pictures per second to record the changes, and an algorithm analyzes the data and produces a measurement in approximately 1 second.

Reporting on their work in the March issue of the journal *Lab on a Chip*, the researchers say they expect that the device will be especially useful to test fresh interfaces for applications with scarce amounts of the fluids to be tested such as custom-synthesized materials from combinatorial chemistry.

Source: NIST