Abstract Submitted
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Volumetric thermal measurements using thermo-liquid crystal (TLC) micro-particles in evaporating drops RODRIGO SEGURA, ALVARO GOMEZ MARIN, CHRISTIAN KAEHLER, Institute for Fluid Mechanics and Aerodynamics, Bundeswehr University Munich — Freely evaporating sessile droplets develop weak temperature gradients that can generate Marangoni flows at the drop's surface. Quantitative temperature measurements of small gradients at such scales are very difficult. In this work, a method to track the temperature of individual thermo-liquid crystal (TLC) particles is employed to extract the temperature field inside an evaporating droplet. TLC thermography has been investigated for several years but the low quality of individual TLC particles, as well as the methods used to extract temperature from their color appearance, has prevented the development of a reliable approach to track their temperature individually. In order to overcome these challenges, an emulsion of stable non-encapsulated TLC micro particles with a narrower size distribution than that of commercial encapsulated TLC solutions was used along with a multi-variable calibration approach, as opposed to the direct hue-temperature relationship usually implemented (Segura et al, Microfluid Nanofluid, 2012). In addition, an optimized color space was implemented as well as circular polarization filtering to remove background noise and improve signal-to-noise ratio. Using this technique, a 3D temperature-velocity field within a droplet could be simultaneously resolved.

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