Microfluidic Interfacial Tensiometry

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INTRODUCTION

Immiscible fluids find diverse applications, yet their interfacial tension $\sigma$ remains a fundamental property that governs their performance. Therefore, accurate and efficient methods to measure interfacial tension facilitate development and refinement of fluid formulations. Microfluidic technology offers a new high-throughput platform for such measurements. In our approach, drops are produced and their dynamics in an extensional flow gradient are analyzed in real-time, and applicability to a broad range of interfacial tension is demonstrated.1

METHOD

Experimental. The microchannel tensiometer was fabricated by conventional rapid prototyping methods (Figure 1). The master was made by contact photolithography using 365 nm UV exposure and SU8-2025 or 2075 resists (Microchem) spin coated on a plasma-cleaned silicon wafer. A poly(dimethylsiloxane) (PDMS; Sylgard 184, Dow Corning2) replica was then made from the master and cored for a cleaned silicon wafer. A poly(dimethylsiloxane) (PDMS; Sylgard 184, Dow Corning2) replica was then made from the master and cored for inputs and outputs. The patterned PDMS surface and a clean glass slide were oxidized for 35 s with a 40 W oxygen plasma (Anatech-Reserve is gratefully acknowledged. This work was carried out in the NIST Materials Science and Engineering Laboratories Director’s Reserve is gratefully acknowledged. This work was carried out in the NIST Combinatorial Methods Center (www.nist.gov/combi).)

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REFERENCES

2. Certain commercial materials and equipment are identified in this paper in order to adequately specify the experimental procedure. In no case does such identification imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that these are necessarily the best available for the purpose.

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