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On demand fusion and triggering of confined chemical reactions in femtoliter volume aqueous droplets controlled by interfacial tension PAT COLLIER, SEUNG-YONG JUNG, SCOTT RETTERER, ORNL — Droplet-based microfluidic platforms offer many opportunities to confine chemical and biochemical reactants in discrete ultrasmall reaction volumes, and investigate the effects of increased confinement on reaction dynamics. Current state-of-the-art microfluidic sampling strategies for creating ultrasmall reaction volumes are predominately steady-state approaches, which result in difficulty in trapping reacting species with a well-defined time-zero for initiation of biochemical reactions in the confined space. This talk describes stepwise, on-demand generation and fusion of femtoliter aqueous droplets based on interfacial tension. Sub-millisecond reaction times from droplet fusion were demonstrated, as well as a reversible chemical toggle switch based on alternating fusion of droplets containing acidic or basic solution, monitored with the pH-dependent emission of fluorescein.

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