Supplementary Information (SI) for Lab on a Chip.


# Supporting Information

# Array-Structured Microcapsule Fibers for Efficient Fire Extinguishing in Confined Spaces

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## 1. Supporting Figures

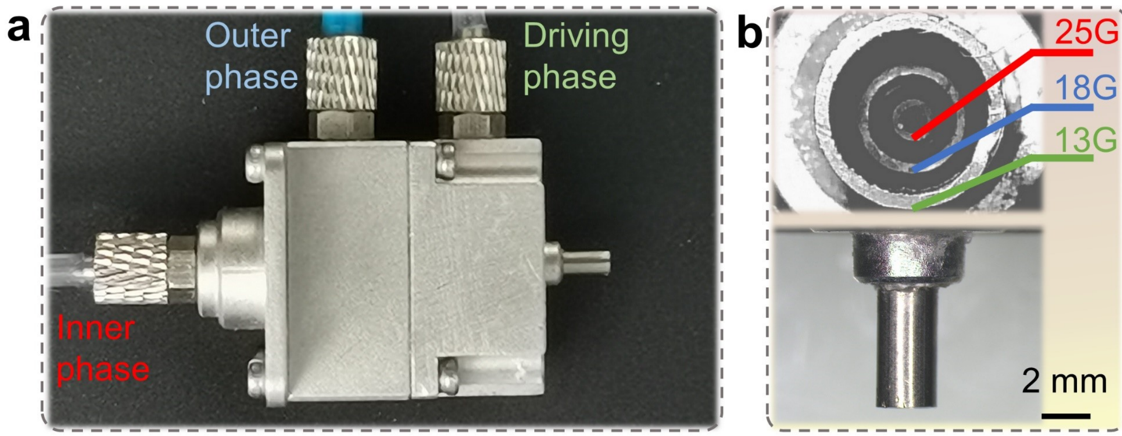


**Fig. S1** (a) Diagram of coaxial flow spinning equipment. (b) Detail of coaxial capillary tubes.

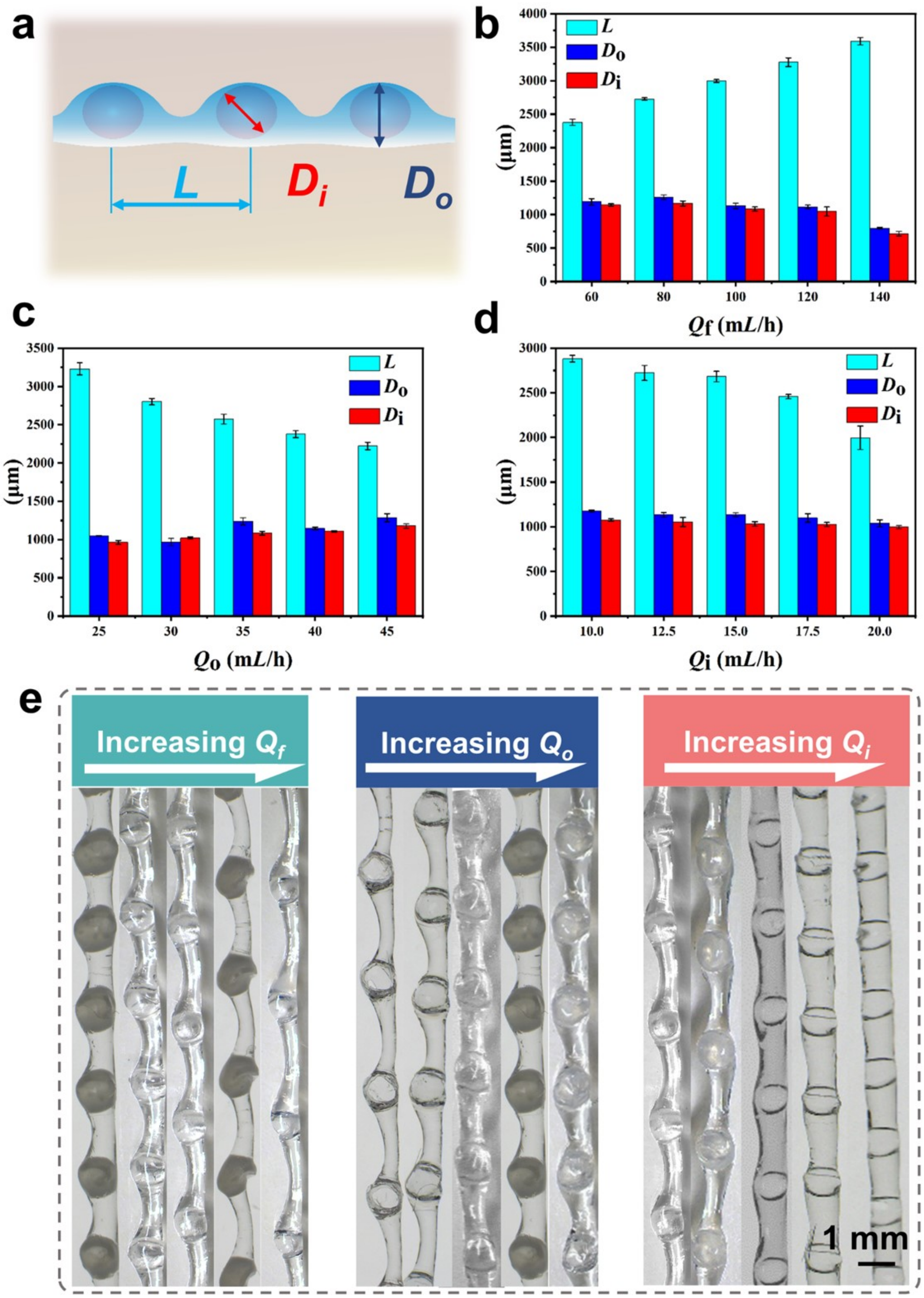


**Fig. S2** (a) Microfiber morphology parameters. (b) Effect of $Q_f$ on microfiber morphology parameters ($Q_i$=10 mL/h. $Q_o$=40 mL/h). (c) Effect of $Q_o$ on microfiber morphology parameters ($Q_i$=10 mL/h. $Q_f$=40 mL/h). (d) Effect of $Q_i$ on microfiber morphology parameters ($Q_o$=10 mL/h. $Q_f$=40 mL/h). (e) Optical micrographs of the corresponding fibers in (b-d).

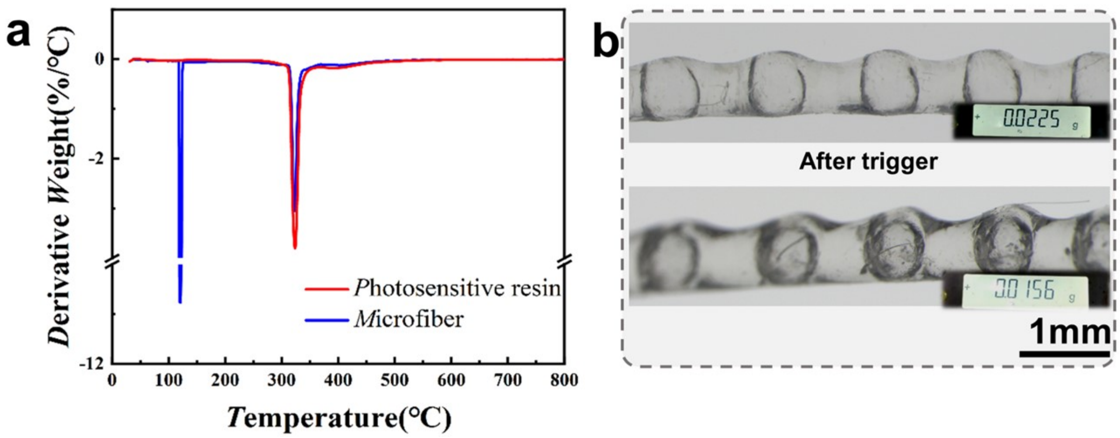


**Fig. S3** (a) DTG curve of photosensitive resin and FEMFs. (b) Mass change of a section of FEMF before and after release of extinguishing agent.

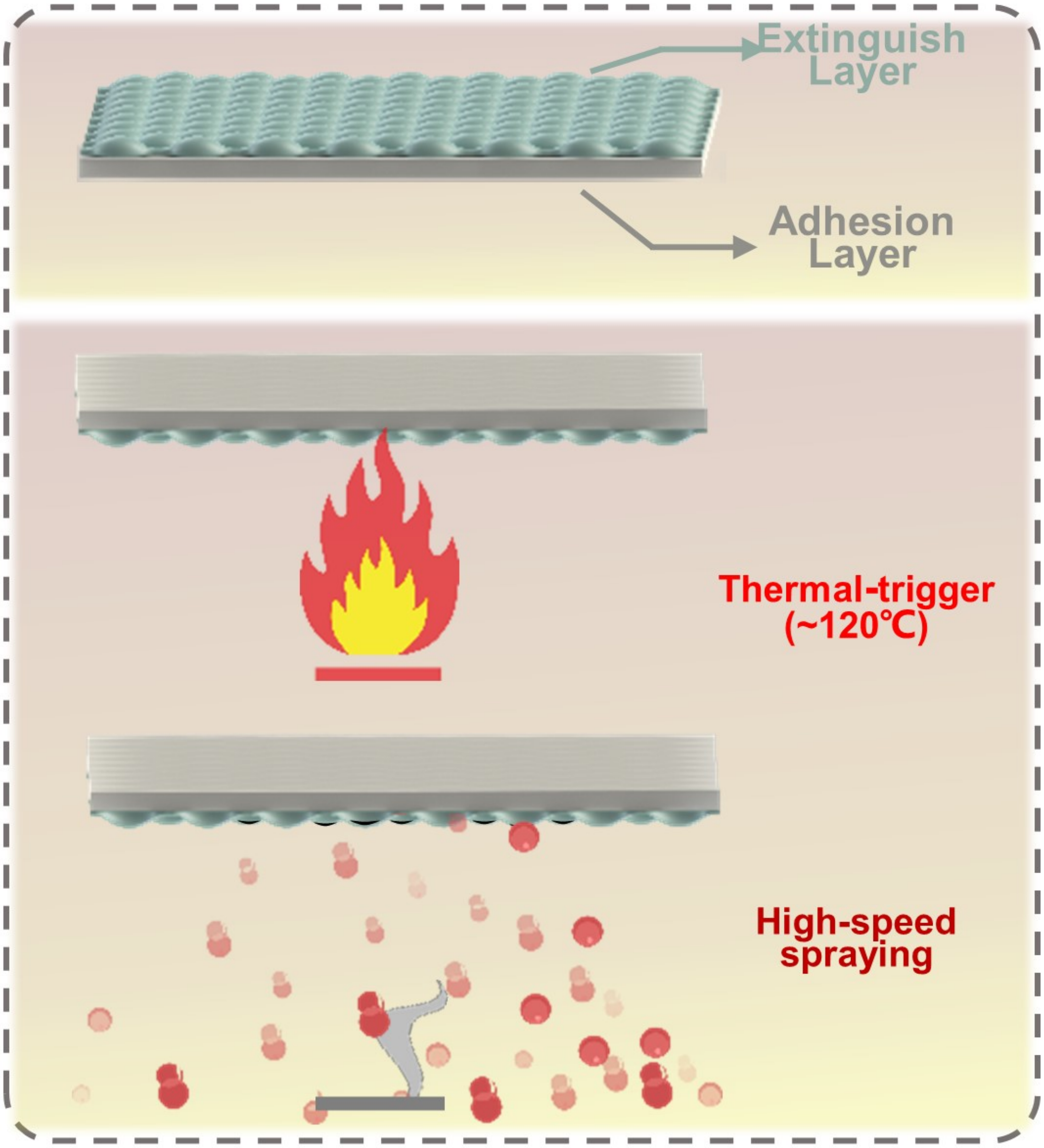


**Fig. S4** Composition of fire extinguishing patch and its fire extinguishing principle schematic diagram.

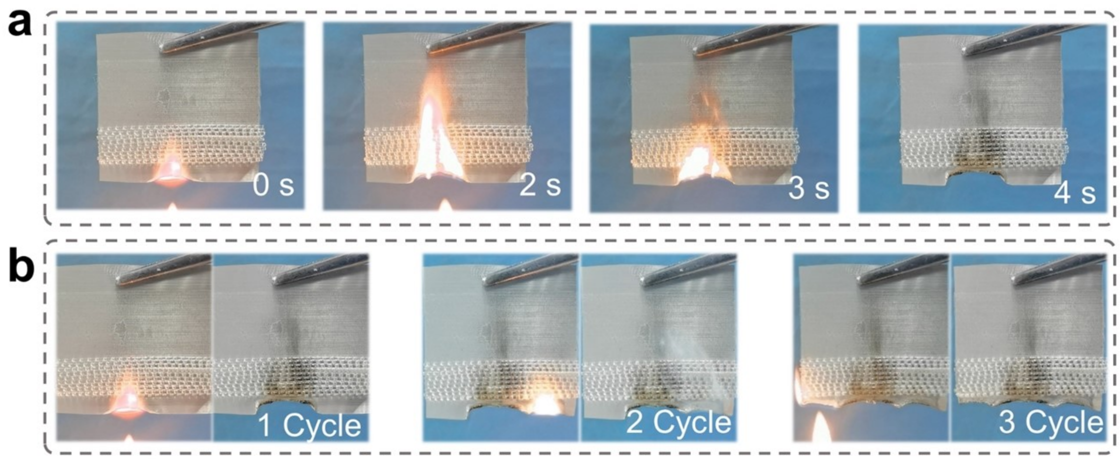


**Fig. S5** (a) The FEP adhered to the surface of the substrate extinguishes the flame. (b) The FEP extinguishes the flames several times.

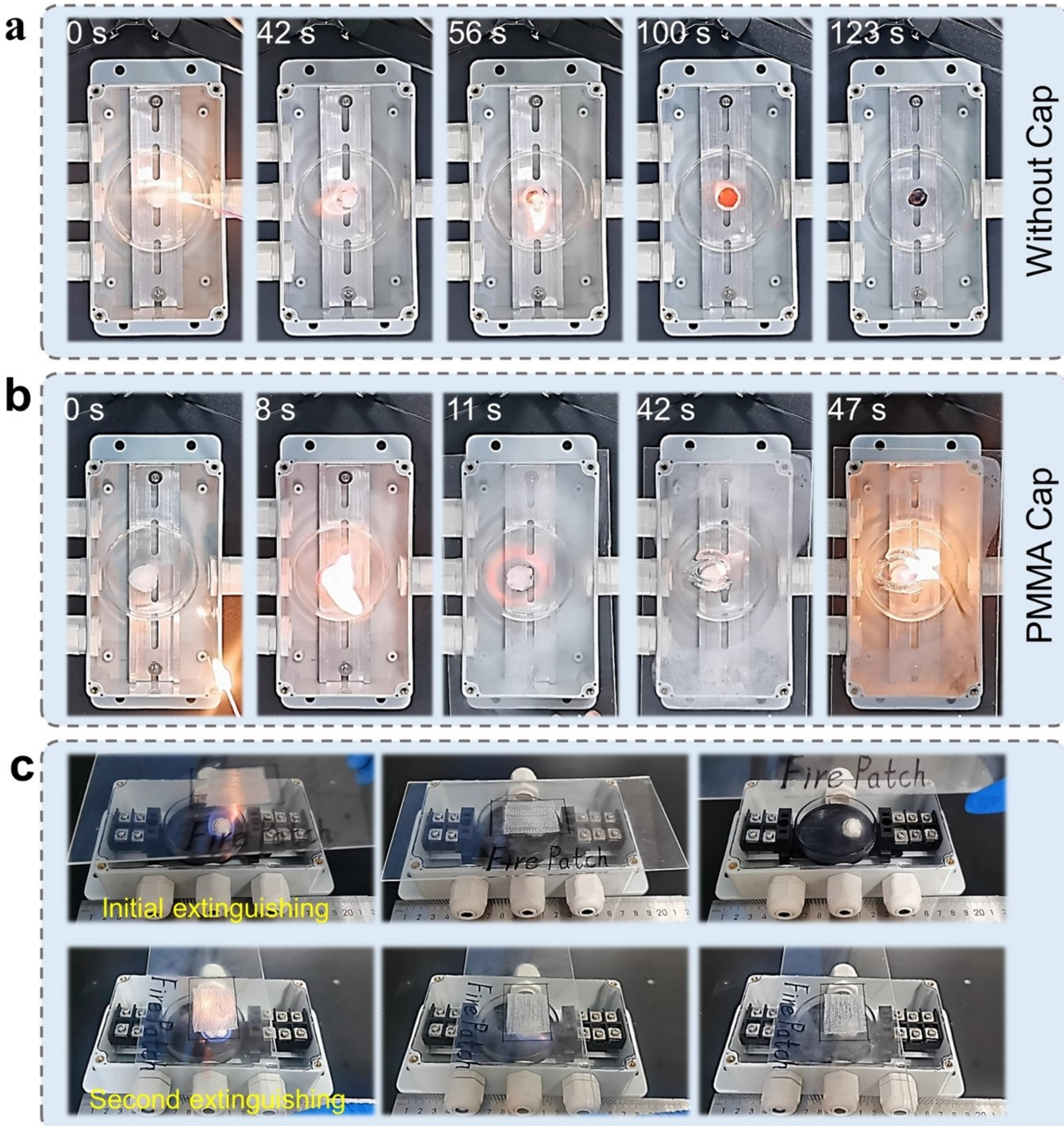


**Fig. S6** (a) The simulated fire source continues to burn for 120 seconds in an open environment. (b) The simulated fire source burns through the PMMA cover. (c) The FEP extinguishes the simulated fire source multiple times.

Based on the microscopic characterization of microfiber knots, we constructed a simplified axisymmetric model (**Fig. S7**) to simulate PFH release under thermal activation. The resin shell interfaces were defined as solid boundary conditions, and a sufficiently large gas diffusion domain was implemented to minimize outlet boundary effects. A high Mach number flow model was adopted to capture the rapid gas expansion. To align with experimental conditions, the internal pressure and temperature of PFH were set to 4 atm (atmosphere) and 383 K (derived from its phase diagram), respectively, while the external environment was maintained at 1 atm and 383 K. The simulation duration was 0.00025 s to resolve transient release dynamics.

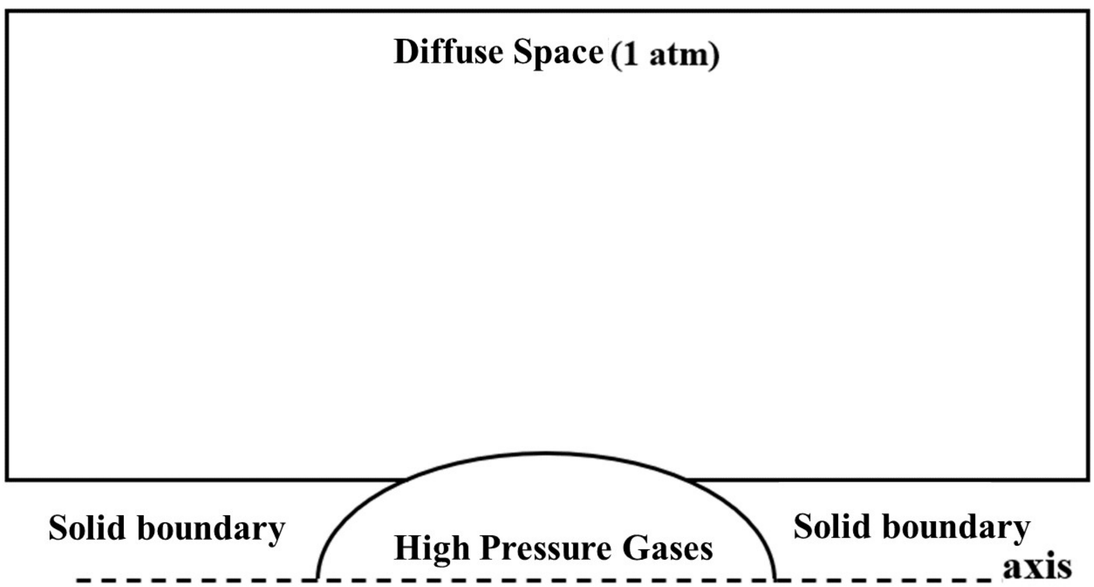


**Fig. S7** Schematic of the simplified knot model in FEMFs.

## 2. Supporting Videos

**Video V1** High-speed photography of the instant release of fire extinguishing agent during knots explosion.

**Video V2** The process of FEMF fire extinguishment.

**Video V3** Demonstration of FEP for fire extinguishing and experimental demonstration of two control groups.