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Laser carved micro-crack channels in paper-based dilution devices

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Abbreviations

LCC	laser carved micro-crack
μPAD	microfluidic paper-based analytical device
PDMS	polydimethylsiloxane

ABSTRACT: We developed novel laser carved micro-crack (LCC) paper-based channels to significantly accelerate the liquid flow without an external pump. For the aqueous solutions they increased the flow velocity 59 times in 16% laser power-8 micro-cracks-LCC channel compared with it in solely-printed channels. All experimental data from both LCC and solely-printed channels were well-fitted by the time-distance quadratic trinomial that we developed on laser power and micro-crack number. We designed and fabricated T-junction microstructures of LCCs. Further, the microfluidic paper-based analytical device (μPAD) of LCC on dye mixing gradient and pH gradient were developed with the characteristics, fast self-acting transportation and high-performance mixing of liquid flows. In the dye mixing gradient the time cost was reduced from 2355s in the solely-printed one to only 123s in the five-stage of this LCC-μPAD. It was useful for quick and long-distance transferences through the multiple units of μPADs. Certainly, this LCC-μPAD was inexpensive, disposable, portable and applicable to resource-limited environments.