Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Compound droplet manipulations on fiber arrays[1] FLORIANE WEYER, MARJORIE LISMONT, LAURENT DREESEN, NICOLAS VANDEWALLE, University of Liege — Recent works demonstrated that fibers are the basis of an open digital microfluidics. Indeed, various processes such as droplet motion, fragmentation, trapping, releasing, mixing and encapsulation can be constructed on fiber arrays. However, addressing a large number of tiny droplets resulting from the mixing of several liquid components is still a challenge. Here we show that it is possible to manipulate tiny droplets reaching a high level of complexity. Wetting droplets are known to glide along vertical fibers. When a droplet reaches an horizontal fiber, it sticks at the crossing if capillary overcomes gravity. Otherwise, the droplet continues its way, crosses the node and leaves a tiny residue. Therefore, a vertical fiber decorated with a series of horizontal fibers will retain residual droplets at the successive nodes. An oil droplet, sliding on the vertical fiber, is able to collect the residues. Thus a multicompound droplet is created. The volume of the residual droplets has been studied and seems to be related to the diameters of both vertical and horizontal fibers. Moreover, the conditions under which the residues are released have been investigated in order to understand the formation of such a fluidic object.

[1]F. Weyer is financially supported by an FNRS grant. This work is also supported by the FRFC 2.4504.12.

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Date submitted: 25 Jul 2014 Electronic form version 1.4