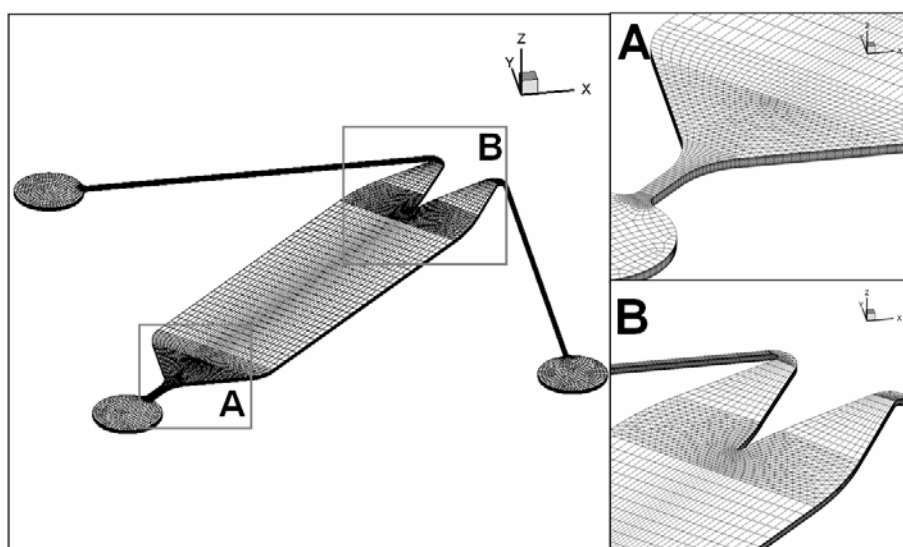
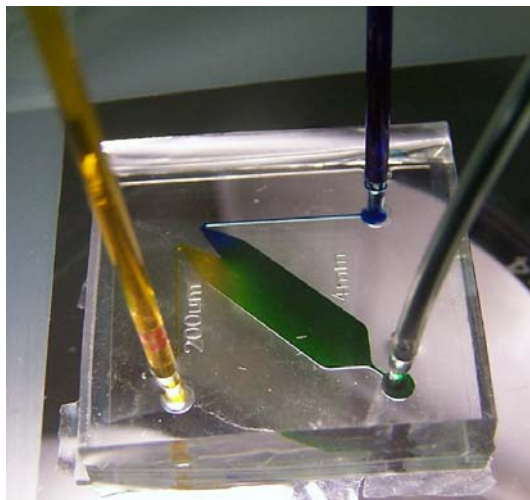


## Supplementary Information

**Fig. S1.** Meshed computational domain using 92,505 grid cells. A structured grid system was used in most of the computational domain; however, for some geometry unstructured grids were required (inset A and B).



**Fig. S2.** Fabricated gradient generator device in operation.



**Movie clips.** The transient of gradient generation in our device were recorded. The first file (submission-movie clip - PEG 8M.wmv) is a 22sec-movie clip that was recorded for 90 min for the case of using 0.0082M PEG solution for osmosis, and the second file (submission-movie clip - PEG 27M.wmv) is a 12s-movie clip that was recorded for 45 min for the case of using 0.0267M PEG solution. Fig. 4(a) and 4(b) are the corresponding figures of the movie clips.