SMART FORCE: From A colloidal droplet to the chip – from fundamental research to business opportunities

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Colloidal Suspensions (**CSs**) where *a solid phase is suspended in a continuous liquid phase* are present in every-day life. In biological or environnemental aqueous solutions, (blood, serum, polluted water..), the dispersed phase is composed of **soft-matter** at the molecular (DNA) or micrometer scale (blood cells, vesicles, bacterium…). In Nanoscience research field, the dispersed phase of **hard matter** micro/nanoparticles (metallic, dielectric, magnetic..) referred as 'artificial atoms' due to the control of the density of their electronic states/composition/size/shape. Due to their nanometer size, they scatter or emit light opening the control of light propagation/optical sensing at the wavelength scale. But to fully study and exploit their nanoscale properties, rapid and low-cost technological ways must be developed in order to localize in a deterministic way CSs on a substrate (**Fig. 1A**).

My intervention will first present an original alternative strategy to assemble particles on chip we started to develop in 2005. I will describe the fundamental physical mechanisms (hydrodynamic, capillarity..) that govern the self-assembly process [1], Then, the power of this technology (**Fig. 1B**) will be demonstrated with several key examples either **in Nanophotonic** (waveguides[2], polychromatic emitters ..[3]), 2D and 3D **Plasmonic** [5,6], or in **Biology** (vesicles [7], DNA combing…). The potentiality of this technology will be illustrated in the fabrication of low-cost SERS substrate [7] or as an ultrasensitive detection tool [8,9].

Finally, the pass we pursue to transform a laboratory experiment as an industrial solution will be described [10].

References

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Figures

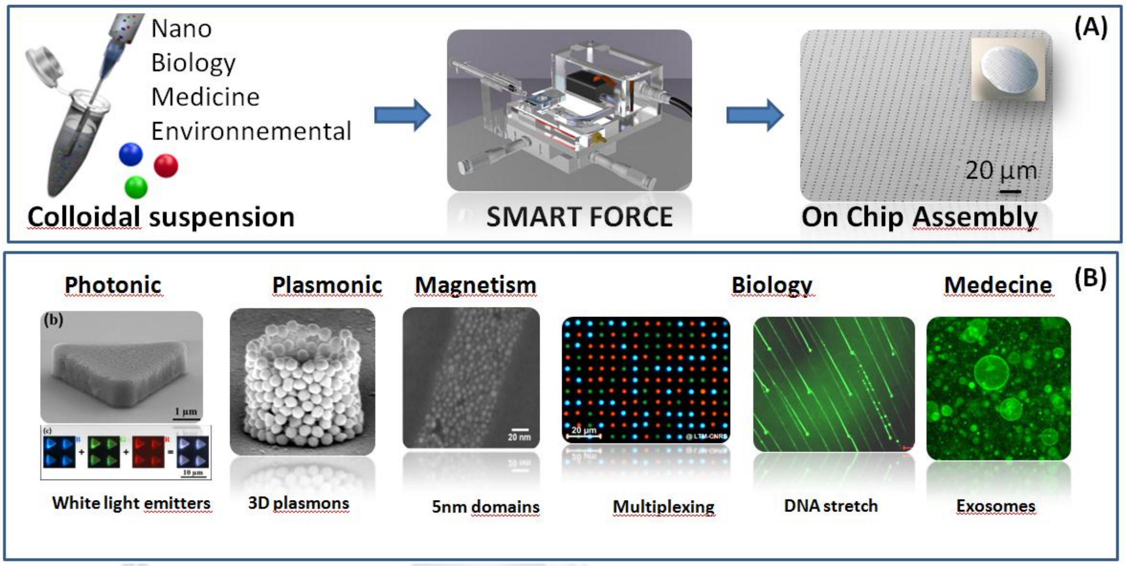

Fig.1 (A): Capillary Force Assembly of Colloïdal suspension based on SMART FORCE Technology. (B): Exemples of colloidal assembly from hard (Micro/Nanoparticles) and soft-matter (DNA, exosomes).