H2020 MSCA - ITN - 2017 - 766007

Magnetics and Microhydrodynamics, from guided transport to delivery

ESR 15 Magnetically enhanced PCR on chip

Research project	The polymerase chain reaction (PCR) has rapidly established itself as the "gold standard" for microbiology assays thanks to its specificity and sensitivity. However, this reaction is still mainly performed with expensive and cumbersome benchtop systems that limit the speed of the assay due to the technical limitations of fast thermal cycling required to trigger the reaction. There are several reports that demonstrate the advantages of microfluidic PCR over standard systems[1]. Furthermore, nanoparticles have been shown to enhance microfluidic PCR performance through enhanced thermal conductivity and convective heat transfer compared to the base fluid[2]. We propose to investigate how ferrofluids (in collaboration with UNISTRA), which experience fast and localized heating when exposed to magnetic fields (magnetic hyperthermia[3]), can yield significant increases in the local heat transfer coefficient using magnetic fields and field gradients on magnetite nanoparticle-containing fluids[4]. The ESR project will be to implement this technology in a microfluidic system exploiting Elvesys' know-how on lab on chips for fast real time quantitative PCR (qPCR)[5], complemented by the network expertise in flow modelling (MPG). *References* [1] *E.A. Ottesen et al., Science, **314** (2006), 1464–67.* [2] *S. Kakaç and A. Pramuanjaroenkij, Int. J. Heat Mass Transf., **52** (2009), 3187–96.* [3] *R.E. Rosensweig, Ferrohydrodynamics (Mineola, New York, 2014).* [4] *R. Azizian et al., Int. J. Heat Mass Transf., **68** (2014), 94–109.*
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Host Institution	Elvesys Innovation Unit Elvesys Microfluidic Innovation Center 83 Avenue Philippe Auguste 75011 Paris (FRANCE)
Required profile	The candidate should hold a MS degree equivalent in Physics, Engineering or Biotechnology. Entrepreneurial mindset is an asset. Excellent command of English (both writing and oral) is mandatory. Interest for interdisciplinary research is important. PhD enrollment is foreseen at UNISTRA. Research stays are planned at the UNISTRA (FRANCE) and MPG (GERMANY). The candidate should not have stayed in France in the past 12 months.