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Integrated optofluidic devices for particle manipulation and microrheology

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Sommario

The integration of optical and microfluidic techniques (optofluidics) opens the way to a new generation of tools for applications in biomedical and industrial fields. Indeed, new Lab-On-a-Chip devices are made possible by the capability of handling tiny volumes of fluids - a mandatory requirement when biological or precious materials are involved - and the integration of photonics and fluidic circuits in the same platform, enabling in-situ sensing and optical manipulation.
Among other techniques, femto-second laser inscription in glass enables fast prototyping for both fluidic and photonic circuits (waveguides, modulators...). By exploiting such technique, in the last five years a variety of optofluidic chips were designed for distinct applications like optical trapping, cell sorting and stretching. More recently, the same device geometry was used as the basis of a new class of microrheological techniques to measure the linear and nonlinear viscoelastic properties of complex fluids (e.g. DNA hydrogels) in a wide frequency and force ranges.

Giovanni Nava (Milano, 1983) graduated in Physics at the University of Milano-Bicocca in 2009 with a thesis on the linear and nonlinear optical properties of Zr-doped Lithium Niobate Crystals. He got his PhD in Electronic, Electric and Computer Science Engineering at the university of Pavia in 2013 with a dissertation on photonics devices for wavelength conversion in doped Lithium Niobate. In its PhD and Post-Doc years he was a visiting researcher at the university of Stanford (USA), Oxford (UK), Muenster (DE) and Copenhagen (DTU - DK). He is now working as a Post-Doc at the university of Milan.

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