interface which ultimately lead to rupture in smaller sized droplets, according to reported models for macroscale droplets systems - [2] the emerging fragmentation results in “daughter” droplets having volumes of about 10-30 % with respect to the initial droplet volume. Remarkably, the picoliter scale downscaling leads to a novel surfactant-driven fragmentation due to the low Bond number (around 10^{-4}-10^{-5}), meaning that droplet immersion is dependent on surface tension forces and not on gravitational forces. In fact, the non-ionic Polyoxyethylene (20) sorbitan monolaurate was observed to permit the droplet immersion in the water phase only if spiked in the water phase at concentrations equal or higher than its critical micellar concentration (i.e. around 0.003% v/v). The resulting oil “daughter” droplets are characterized by a chip with integrated microelectrodes, permitting to extract number, velocities and diameter distribution (peaked at about 3 μm) employing electrical impedance measurements. In accordance with reported models, the electrical characterizations show that the droplets have volumes in the femtoliter scale and are subjected to inertial focusing. [3] This work can be considered an important advancement for understanding the effects of downscaling on fragmentation phenomena at immiscible interfaces, leading to a knowledge platform for a tailored oil droplets fabrication applicable for drug encapsulation, pharmaceutic preparations, and thin-film wrapping around droplets. [4]

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#P003 - ON THE EFFECT OF DOWNSCALING IN INKJET PRINTED LIFE-INSPIRED COMPARTMENTS

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The fabrication of size-scalable liquid compartments is a topic of fundamental importance in synthetic biology, aiming to mimic the structures and the functions of cellular compartments. Here, inkjet printing is demonstrated as a customizable approach to fabricate aqueous compartments at different size regimes (from nanoliter to femtoliter scale) revealing the crucial role of size in governing the emerging of new properties. At first, inkjet printing is shown to produce homogenous aqueous compartments stabilized by oil-confinement with mild surfactants down to the hundreds of picoliter scale [1]. Raster Image Correlation Spectroscopy allows to monitor few intermolecular events by the involvement of protein-binding assays within these compartments [2]. Subsequently, in order to reduce droplet size at values below the nozzle size, a theoretical model from Eggers et al. [3] is experimentally reproduced permitting to obtain femtoliter-scale aqueous droplets from picoliter-scale microchannels [4]. As a remarkable difference to picoliter scale droplets, downscaling at the femtoliter-size triggers the spontaneous formation of molecularly crowded shell structures at the water/oil interface stabilized by a mixture of biocompatible surfactants. The shells have typical thickness in order of hundreds of nanometers, in accordance with theoretical models [5]. Molecular crowding effects in these systems are tested by using fluorescence lifetime imaging under the phasor plot approach [6], revealing different characteristic lifetimes of specific probe molecules in the confined volumes with respect to bulk solutions. The femtoliter-scale compartments autonomously trigger the formation of unique features (e.g., up-concentration, spatial heterogeneity, molecular

proximity) that are mediated by the intermolecular interactions in these novel environments, ultimately permitting to mimic the native conditions of sub-cellular scale compartments. The crowding conditions in femtoliter-scale droplets do not to affect the conformation variation of a model DNA hairpin in presence of molecular triggers and of a CYP2E1-catalyzed enzymatic reaction. Our results can be a first step towards the fabrication of size-scalable *lab-on-a-chip* compartments mimicking sub-cellular environments.

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#P004 - CROSSOVER IN ELECTRON-GAS RELAXATION DYNAMICS VS EXCITING PHOTON ENERGY IN EUV-EXCITED ALUMINIUM

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We report a time-resolved study of the relaxation dynamics of Al films excited by ultrashort intense free-electron laser (FEL) extreme ultraviolet pulses. The system response was measured through a pump-probe detection scheme, in which an intense FEL pulse acted as the pump, while a time-delayed ultrafast pulse probed the near-infrared (NIR) reflectivity of the Al film. The pump pulse wavelength was varied in the range 18 – 42 nm. Remarkably, following the intense FEL excitation at the shortest wavelength, the reflectivity of the film exhibited no detectable variation for hundreds of femtoseconds, after which it decreases. Following recent theoretical calculations of the EUV-excited electron dynamics, the delayed NIR-reflectivity evolution is interpreted invoking the formation of very-long-living non-thermal hot electron distributions in Al after exposure to intense EUV pulses. With increasing wavelength of the EUV pump pulse the reflectivity decreases with shorter delay and becomes essentially instantaneous at 42 nm. This evidence for a crossover in the electron gas relaxation dynamics suggests that the NIR reflectivity, due to excitations around the Fermi level, starts to be affected only when the hot electrons thermalize to the valence band.

#P005 - MAPPING OF LIGHT EMITTING DEFECTS IN ZNO NANORODS UNDER DIFFERENT THERMAL ANNEALING

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In the last few years, ZnO nanostructures have received a growing interest for potential application in light emitting devices, sensing and optoelectronics. Among the different synthesis processes,