Microfluidic chips for biomolecular crystal growth and serial crystallography

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Twenty years ago, microfluidics opened up new possibilities and brought many benefits for the crystallization of biomolecules. Indeed, microfluidic systems facilitate the manipulation of nano-volumes of sample solutions, as well as extreme miniaturization and parallelization of crystallization assays. In addition, they provide a convection-free environment that favors the growth of high-quality crystals [1].

As an illustration, a new multifunctional microchip will be presented that combines 1) the search and optimization of crystallization conditions of biomolecules by the counter diffusion method, 2) crystal identification by fluorescence microscopy, 3) microcrystalline seeding, 4) derivatization of crystals by substrate soaking, and 5) routine in situ crystal analysis at room temperature. The concept was already tested on a large panel of biomolecules including RNA and various soluble or membrane proteins [2-3]. A new chip design and our latest results in microcrystallization and in situ serial synchrotron crystallography at room temperature (RT-SSX) will be presented.

Figure 1. On-chip biomolecular crystal analysis by RT serial synchrotron crystallography