Microtubular NEMS for on- and off-chip biosensing and medical applications

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Nanomembranes are thin, flexible, transferable and can be shaped into 3D microtubular NEMS architectures. This makes them attractive for a broad range of applications and scientific research fields ranging from novel hybrid heterostructure devices to ultra-compact 3D systems both on and off the chip. If nanomembranes are differentially strained they deform themselves and roll-up into microtubular structures upon release from their mother substrate. Rolled-up nanomembranes can be exploited to rigorously compact electronic circuitry into microtubular NEMS\(^1\). As rolled-up microtubes can be easily tuned into the size range of single cells, they are perfectly suited to study single cell behaviour in ultra-sensitive yet fully integrative lab-in-a-tube systems\(^2,3\). As off-chip components they address exciting environmental and biomedical applications. For instance, if magnetic tubes or helices are combined with spermatozoa, such hybrid micro-biorobotic motors offer new perspectives towards assisted reproduction technologies and drug delivery protocols\(^4-6\). However, while such micrometer sized robots offer great opportunities towards medical applications they face equally big challenges when considering *in-vivo* implementation\(^7\).

References


