

NANO HIGHLIGHT

Titanium-Based Micro-channel Techniques to Probe the Structure of Nanometer Scale Protein Complexes

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An important goal in biological physics is to develop tools that can probe and elucidate the structure of supramolecular assemblies of biological molecules, which, in turn, determine their cell functions. We have developed new methods of producing surface-coated microchannels with micron size features, for the purpose of studies of structures of confined and aligned nanometer scale biological assemblies (see Figure 1) [1-3]. The future utilization of these micro-channel techniques as probes of protein-protein interactions will help us understand the differences in the structures between protein assemblies derived from healthy and diseased cells.

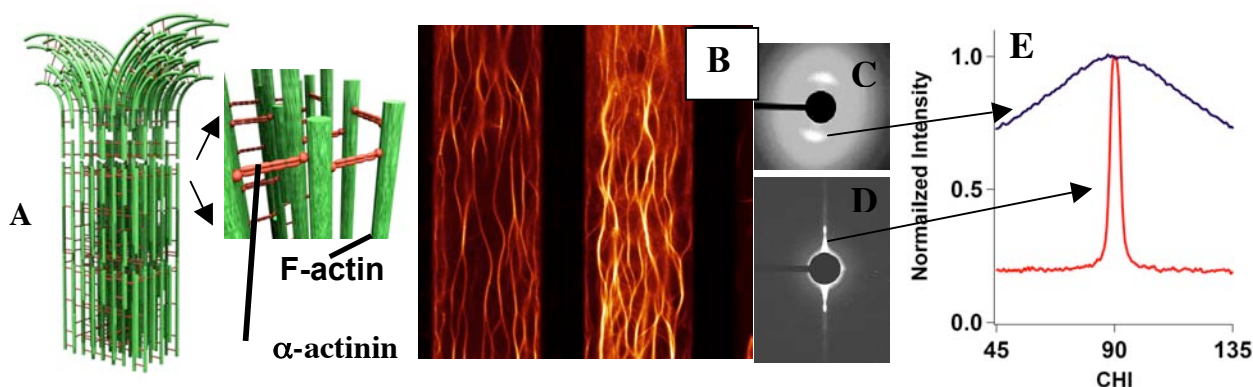


Fig. 1 Confinement of nanometer scale filamentous actin bundles in micro-channels leading to bundle alignment required for protein structure studies. (A) Schematic of a filamentous (F) actin bundle and a blow-up showing the cross-linking protein α -actinin. (B) Confocal microscopy fluorescence shows the nature of oriented bundles confined within micro-channels. (C, D, E) Two-dimensional synchrotron x-ray scattering studies of the F-actin/ α -actinin protein bundles confined in a microchannel device demonstrates the high degree of alignment of the protein bundle on the nanometer scale (D and E, red curve). C and E (dark curve) are unaligned control samples.

References

- [1] For further information send e-mail to safinya@mrl.ucsb.edu
- [2] Ordering of filamentous proteins and associated molecules through confinement in micro-channels, N. F. Boussein, L. S. Hirst, Y. Li, C. R. Saffinya, Zuruzi Abu Samah, N. MacDonald, R. Pynn *Applied Physics Letters* **85**, 5775-5778, 2004.
- [3] L. S. Hirst, E. Parker, Z. Abu-Samah, Y. Li, N. MacDonald, C. R. Saffinya "Microchannel system in Titanium and Silicon for Structural & Mechanical Studies of Aligned Protein Assemblies", *Langmuir* **21**, 3910-14 (2005)