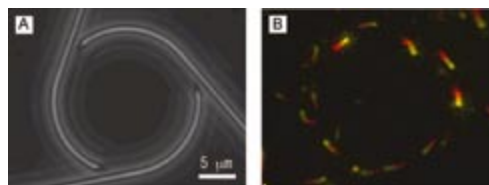


Controlling the Direction of Movements by Protein Molecular Motors

The kinesin molecular motor moves unidirectionally along microtubules that serve as filamentous tracks. By fabricating micrometer-scaled troughs on glass surfaces and by adding arrowhead-shaped patterns to the troughs, we were able to realize unidirectional, one dimensional movements of microtubules. The gliding bacterium *Mycoplasma mobile* is another attractive material of nanoactuators. By taking advantage of these cells to move along walls of lithographic patterns, we have succeeded to make them move unidirectionally along lithographic tracks. These unidirectional movement systems should be foundation of a micro-belt conveyor system to be used in, for example, miniature chemical plants.



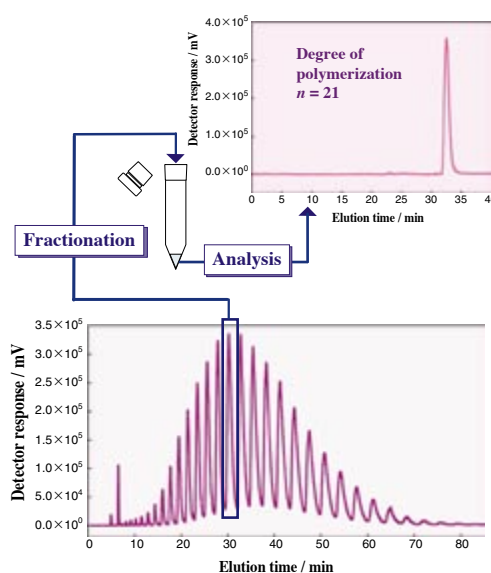
Unidirectional movement of *M. mobile* cells along circular tracks. **A**, Scanning electron micrograph of a part of the repetitive broken circular patterns. **B**, Overlay of five consecutive fluorescence micrographs taken at 0.33 s intervals. The color gradient shows the counter-clockwise rotation of all 13 cells along the circular track (time sequence: yellow to orange to red).

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Precise Quantitative Analysis using Uniform Oligomers

Uniform oligomers are special polymers with no molecular weight distribution. We separated uniform oligomers from commercial monodisperse samples by preparative super-critical fluid chromatography. Using equimolar mixtures of uniform oligomers, we showed it possible to evaluate the quantitiveness of matrix-assisted laser desorption/ionization time-of-flight mass spectrometry for analysis of molecular weight distribution of a monodisperse polymer sample. Uniform oligomers are also useful to know exact values of physical properties of polymers. We measured their diffusion coefficients and radii of gyration in dilute aqueous solutions and have shown clear molecular weight dependence of these properties.



Preparative super-critical fluid chromatography (SFC) chromatogram for poly(ethylene glycol) 1000 (bottom) and analytical SFC chromatogram for a separated uniform oligomer with the degree of polymerization $n = 21$ (top)

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