

## CONDUCTANCE OF ORGANIC NANOWIRES USING TWO-/FOUR-PROBE FINE ELECTRODES FABRICATED BY SPM NANOFABRICATION

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Scanning probe microscopy (SPM) based nanofabrication (SPM nanofabrication) has been developed and used to fabricate two- or four-probe fine electrodes and several kinds of nanowires made of conducting polymers have been evaluated by SPM and the fine electrodes [1].

A new form of molecular nanotubes was synthesized by Harada et al. by cross-linking of self-assembled molecular necklaces made of  $\alpha$ -cyclodextrins [2]. It was demonstrated that we can use cyclodextrin molecular nanotubes for forming inclusion complexes made of linear polymer chains and molecular nanotubes [3]. We try to use the inclusion complexes made of conducting polymers and cyclodextrin molecular nanotubes as molecular interconnects because they have advantages of: (a) they can be synthesized with highly controlled length; (b) electrical property can be controlled over the range from semiconductor to metal by doping; (c) they can be chemically bonded with less changes of their electronic properties with other functional molecules to create circuits with more complex functionality.

A key step for measuring the property of those small structures and evaluating the performance of the molecular devices is how to connect the atomic and molecular structures to bulk electrodes. We report on a method using SPM nanofabrication and fine electrodes fabricated on SiO<sub>2</sub> or sapphire surfaces. In order to introduce p<sub>3</sub>-conjugated poly (3-hexylthiophene) (P3HT) molecules onto H-terminated surfaces, we have used a pulse-injection method. Isolated molecules of P3HT were observed by STM. The P3HT molecules comprised almost all-*trans* conformation, reflecting the rigid feature of the molecular chains. We could control the surface density of the fixed molecules by changing the amount of the injected solution [4].

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