The new preparation method of nanowires containing various organic molecules

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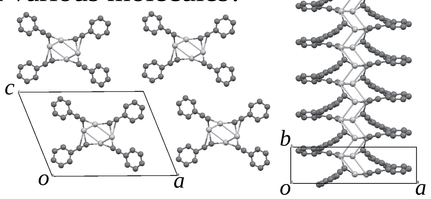
1. Introduction

It will be quite worthwhile if there is a method by which you can prepare nanowires from any organic molecules. Here, we report the new method to construct nanowires from various ethynyl substituted organic molecules.

How to create nanowires from various molecules?

We focused on the crystal structures of silver and copper phenylacetylide (M-C≡C-Ph), whose highly anisotropic structure makes them quite thin needle crystal: nanowire.

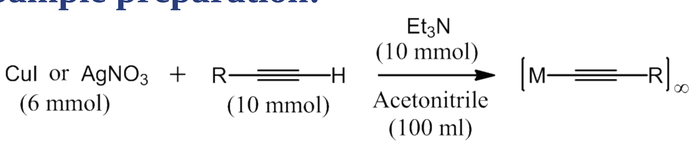


The crystal structure of Ag-C≡C-Ph.
(S. S. Y. Chui et al., *Chem. Eur. J.*, **2005**, 1739)

It is particularly important that this one-dimensional structure is, judging from the crystal structure, mailnly due to the interaction between metal cations and ethynyl anions, while the terminal phenyl groups does not have a significant impact on the structure. Therefore, it is suggested that the silver and copper acetylides M-C≡C-R tend to form nanowires regardless of the substituent R.

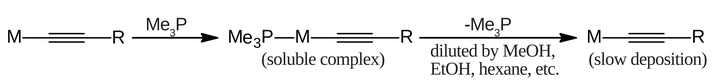
2. Experimental

Sample preparation:

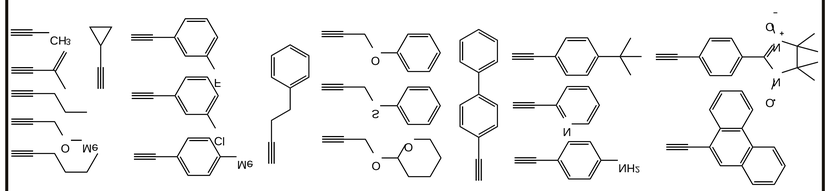


Recrystallization:

If no nanowire-shaped crystal was obtained, we tried to convert them to nanowires by recrystallization.

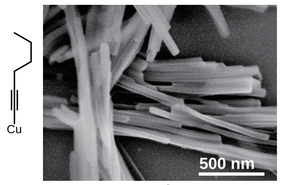


Ethynyl-substituted organic molecules:

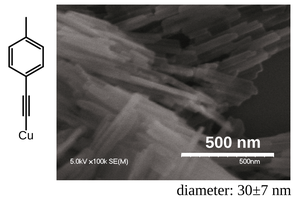


3. Results

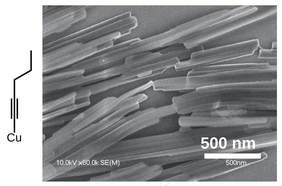
Nanowires (as-prepared)



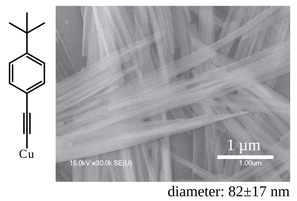
diameter: 38±9 nm



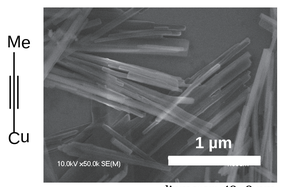
diameter: 30±7 nm



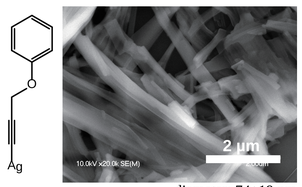
diameter: 46±8 nm



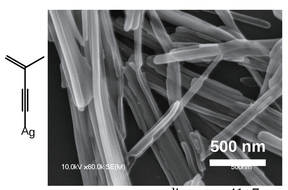
diameter: 82±17 nm



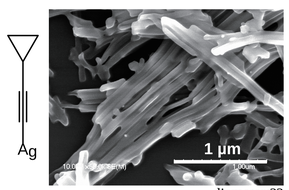
diameter: 48±8 nm



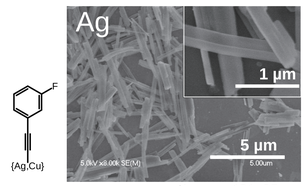
diameter: 74±19 nm



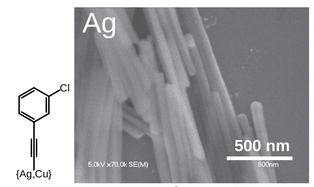
diameter: 41±7 nm



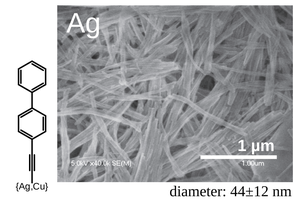
diameter:??



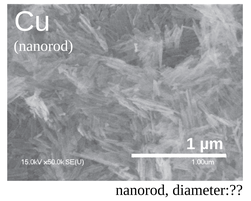
diameter:121±35 nm



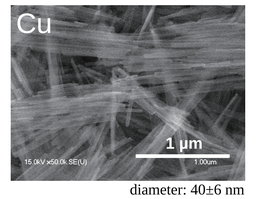
diameter: 69±17 nm



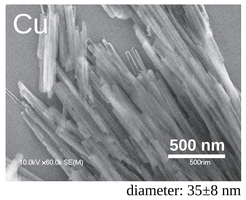
diameter: 44±12 nm



nanorod, diameter:??

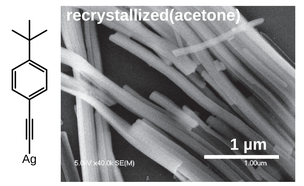


diameter: 40±6 nm

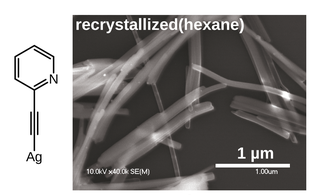


diameter: 35±8 nm

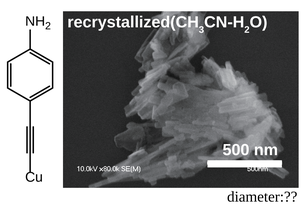
Nanowires & nanorods (recrystallized)



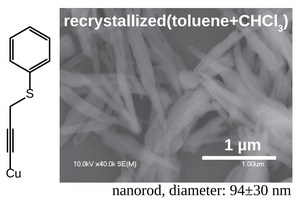
diameter: 75±26 nm



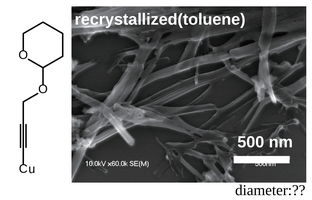
diameter: 94±24 nm



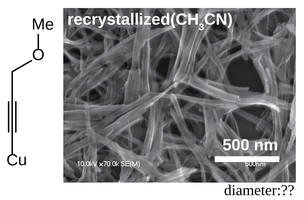
diameter:??



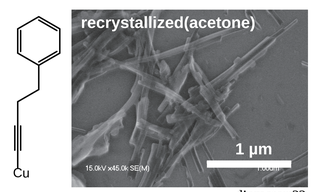
nanorod, diameter: 94±30 nm



diameter:??



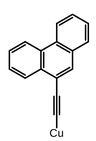
diameter:??

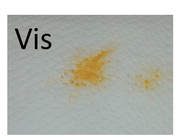


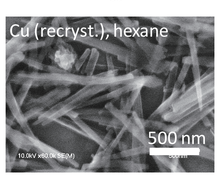
diameter:??

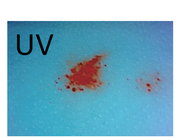
Functional nanowires

Fluorescent nanowire

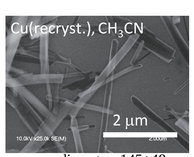




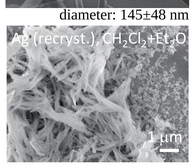


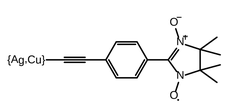


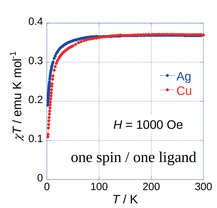
Paramagnetic nanowire



diameter: 145±48 nm







4. Conclusion

We developed a preparation method for nanowires, by which we can construct nanowires from various ethynyl substituted organic molecules.

The method also enables us to prepare functional nanowires such as magnetic nanowires and fluorescent nanowires, by using ethynyl-substituted functional molecules.