

Nano/micro structures formed by [6]cycloparaphenylene via the coffee ring effect

Yuki Nagai^a, Sieun Choi^a, Utah Mashiko^a, Takanobu Minakawa^b, Shunji Kurosu^c
and Toru Maekawa^{a,b,c}

^a Graduate School of Interdisciplinary New Science, Toyo University

^b Department of Biomedical Engineering, Faculty of Science and Engineering, Toyo University

^c Bio-Nano Electronics Research Centre, Toyo University

Cycloparaphenylene (CPP) is one type of carbon nanomaterials in which benzene rings are covalently bonded at the para position to form a ring-like structure [1]. Although it has been more than 13 years since CPP was first synthesized, most of the research to date has focused on (a) the development of synthetic methods of CPPs with different numbers of benzene rings, (b) gram-scale synthesis of CPPs, (c) chemical modification of CPPs, and (d) bottom-up synthesis of carbon nanotubes [1-2]. Therefore, secondary structures formed by CPPs have not yet been well studied.

In this study, we formed secondary structures composed of CPPs via self-assembly utilizing the coffee ring effect. Note that the coffee ring effect is expected to be applied to the bottom-up synthesis of nano- and micro-structures [3]. Particles and molecules in colloidal solution are deposited along the edge of the droplet while the droplet evaporates on a solid surface [4].

Solution of [6]CPP dispersed in organic solvents was dropped onto a heated silicon (Si) substrate (see Figure 1). The structures deposited on the substrate were observed by a scanning electron microscope (SEM). In the poster session, nano- and micro-level structures composed of [6]CPPs will be shown and discussed.

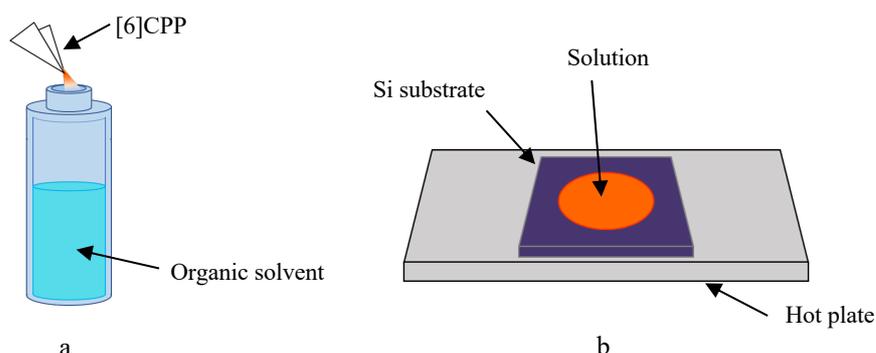


Figure 1. Outline of the experimental setup and method. a: [6]CPP is dissolved in different types of solvents. b. The solutions dropped on a hot plate are evaporated.

References:

- [1] Segawa, Yasutomo, Yagi, Akiko, Itami, Kenichiro. *Phys. Sci. Rev.*, **2**, 20160102 (2017).
- [2] Itami, Kenichiro. *Pure Appl. Chem.*, **84**, 907-916 (2012).
- [3] Shunji Kurosu et al, *Adv. Nat. Sci.: Nanosci. Nanotechnol.*, **4**, 025003 (2013).
- [4] Robert D. Deegan, Olgica Bakajin, Todd F. Dupont, Greb Huber, Sidney R. Nagel, Thomas A. Witten, *Nature*, **389**, 827–829 (1997)