

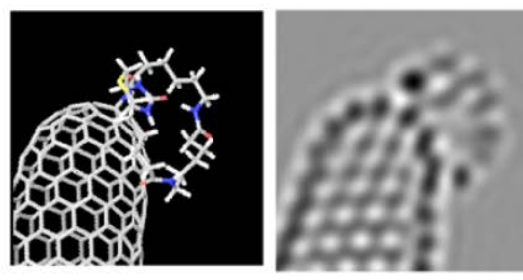
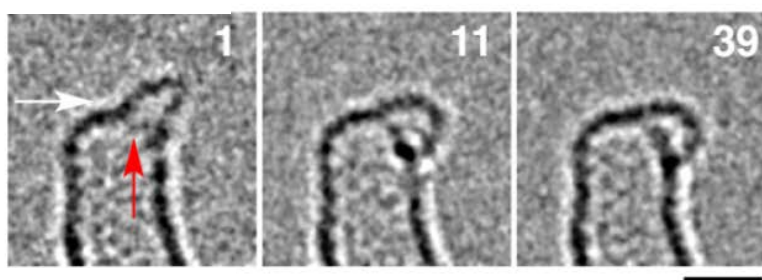
Single-molecule atomic-resolution real-time TEM imaging

Product used : Transmission Electron Microscope (TEM)

These data are direct microscopic observations of the structural changes of molecules in situ using single-molecule atomic-resolution real-time TEM (SMART-TEM) imaging method. Atomic-resolution TEM observations were carried out on JEM-ARM200F equipped with an image-forming aberration corrector.

Direct Microscopic Observation of Conformational Change of a Single Organic Molecule

(a) 80 kV



(b) 60 kV

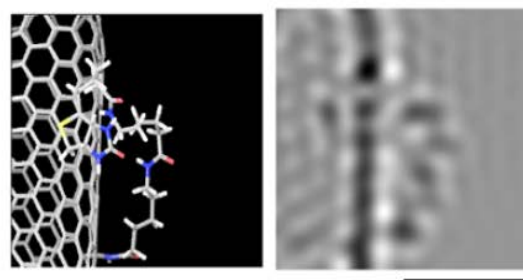
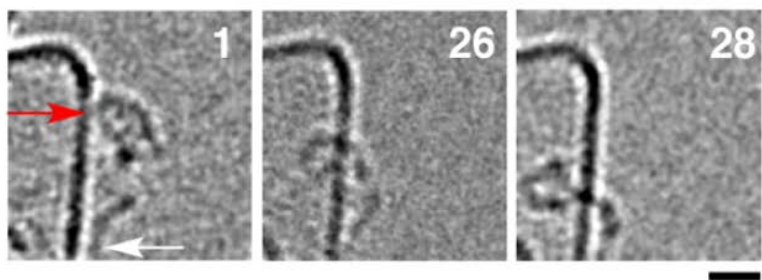


Figure 1. Representative images of molecule 1 extracted from TEM movies at different acceleration voltages. A plausible molecular model and its simulated TEM image are shown for molecule 1. The number refers to the frame number sequentially numbered from the beginning of the imaging. The red arrow points to the biotin terminal and the white arrow to the amide group connected to the CNH. Scale bars are 1 nm. Simulation images were generated by a multislice procedure implemented using standard simulation software.

(a) Molecule 1 is seen to be static at 80 kV. Irradiated for 47 s with a total electron dose of $6.1 \times 10^7 \text{ e}^- \text{ nm}^{-2}$. (b) Rapidly moving 1 at 60 kV. Irradiated for 12 s with a total electron dose of $3.6 \times 10^5 \text{ e}^- \text{ nm}^{-2}$.

Adapted with permission from J. Am. Chem. Soc. 2015, 137, 3474-3477. Copyright 2015 American Chemical Society.

Direct Microscopic Observation of Individual C₆₀ Dimerization

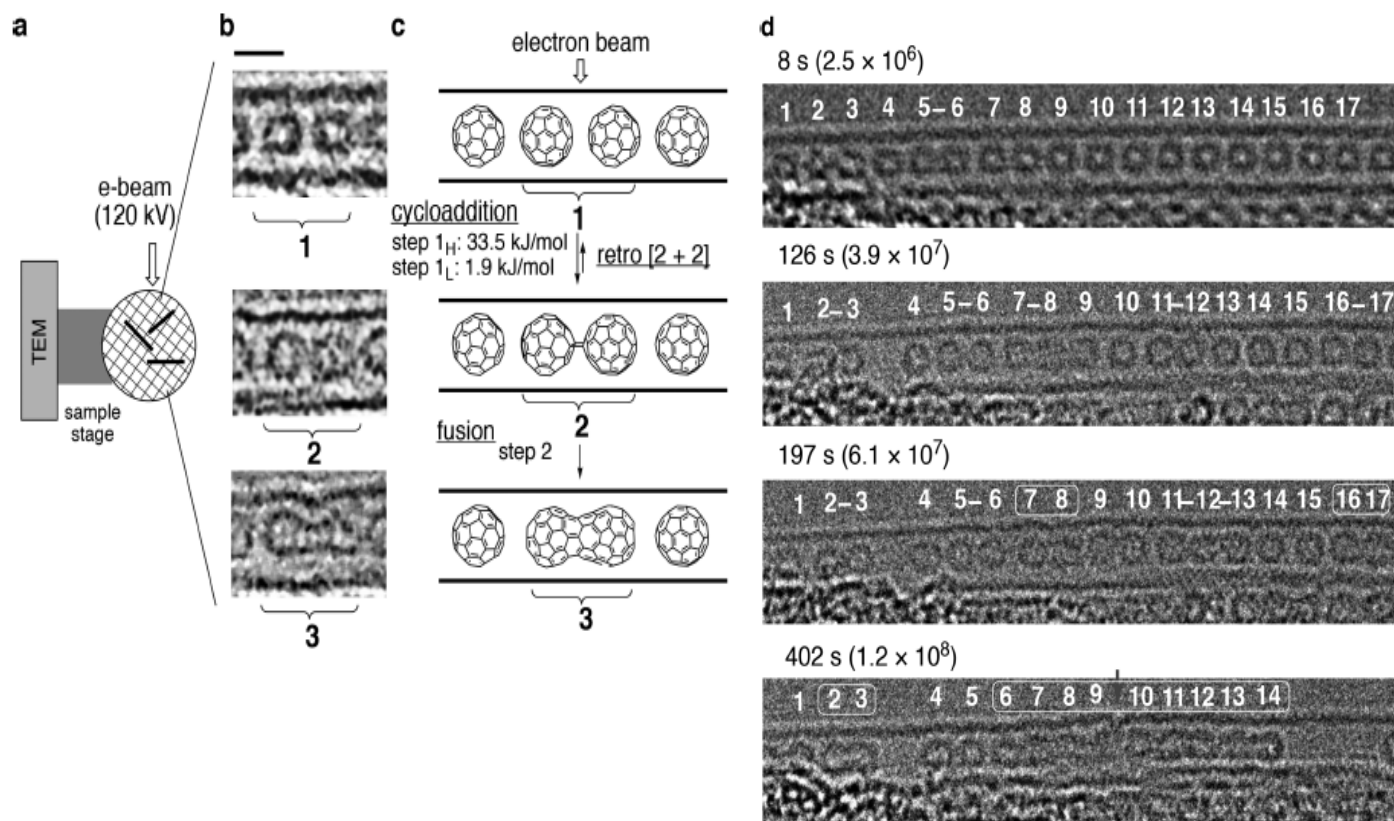


Figure 2. SMART-TEM imaging of the dimerization of C₆₀@CNT.

(a) Schematic illustration of the experiments using C₆₀@CNTs on a temperature-controlled microgrid. (b) TEM images of intermediates in a 1.4 nm CNT. The scale bar is 1 nm. (c) Four types of reactions observed using TEM. (d) Steps 1_H and 2 seen for 17 molecules at 443 K under 120 kV acceleration voltage and with an electron dose rate (EDR) of $3.1 \times 10^5 \text{ e}^- \text{ nm}^{-2} \text{ s}^{-1}$. Numbers in parentheses denote total electron dose (TED) of each frame with the unit of $\text{e}^- \text{ nm}^{-2}$. A [2 + 2] cycloadduct is indicated as hyphenated numbers, and a fused oligomer as boxed numbers. A defect is shown with a red arrow. The scale bar is 2 nm. The original movie is in the Supporting Information (Movie_S1.avi). Adapted with permission from J. Am. Chem. Soc. 2017, 139, 18281-18287. Copyright 2017 American Chemical Society.

※These data courtesy of Profs. Eiichi Nakamura and Koji Harano, The University of Tokyo

Copyright © 2018 JEOL Ltd.

Certain products in this brochure are controlled under the "Foreign Exchange and Foreign Trade Law" of Japan in compliance with international security export control. JEOL Ltd. must provide the Japanese Government with "End-user's Statement of Assurance" and "End-use Certificate" in order to obtain the export license needed for export from Japan. If the product to be exported is in this category, the end user will be asked to fill in these certificate forms.

JEOL | JEOL Ltd.

3-1-2 Musashino Akishima Tokyo 196-8558 Japan Sales Division Tel. +81-3-6262-3560 Fax. +81-3-6262-3577
www.jeol.com ISO 9001 • ISO 14001 Certified

• AUSTRALIA & NEW ZEALAND • BELGIUM • BRAZIL • CANADA • CHINA • EGYPT • FRANCE • GERMANY • GREAT BRITAIN & IRELAND • ITALY • KOREA • MALAYSIA • MEXICO • RUSSIA • SCANDINAVIA
• SINGAPORE • TAIWAN • THE NETHERLANDS • USA

▼ Local offices

