Supporting Information

Homogeneous Decoration of Metal-Organic Frameworks (MOFs) with Core-Shell Structures on Carbon Nanotubes

JongTae Yoo, SuHyun Lee, Chang Kee Lee, ChaeRin Kim, Tsuyohiko Fujigaya, Hyun Jin Park, Naotoshi Nakashima, and Jin Kie Shim

Korea Packaging Center, Korea Institute of Industrial Technology, Ojeong-gu, Bucheon 421-742, South Korea
Department of Applied Chemistry, Graduate School of Engineering, Kyushu University, 744 Motooka, Nishi-ku, Fukuoka 819-0395, Japan
College of Life Sciences and Biotechnology, Korea University, Seongbuk-gu, Seoul 136-701, South Korea
International Institute for Carbon-Neutral Energy Research (I2CNER), Kyushu University, 744 Motooka, Nishi-ku, Fukuoka 819-0395, Japan

* Corresponding author. E-mail: nakashima-tcm@mail.cstm.kyushu-u.ac.jp (N. N.); jkshim@kitech.re.kr (J. S.)
Fig. S1 Scanning electron microscope (SEM) images of the CNT@ZIF-8 core-shell structures at magnifications of (A) 5, (B) 10, and (C) 20 k. Scale bars: (A) 2 and (B and C) 1 μm.
Fig. S2 Raman spectra of the CNT (black dot-line), CNT/ZIF-8 (black dash-line), PVP-CNT/ZIF-8 (black solid-line), graphene (brown dot-line), G/ZIF-8 (brown dash-line), PVP-G/ZIF-8 (brown solid-line), GO (yellow-brown dot-line), GO/ZIF-8 (yellow-brown dash-line), and PVP-GO/ZIF-8 (yellow-brown solid-line).
**Fig. S3** SEM images of the ZIF-8 at low (left) and high (right) magnifications. Scale bars: 1 µm (left) and 100 nm (right).
Fig. S4 FT-IR spectra of the ZIF-8 (blue solid-line), CNT (black dot-line), CNT/ZIF-8 (black dash-line), PVP-CNT/ZIF-8 (black solid-line), graphene (brown dot-line), G/ZIF-8 (brown dash-line), PVP-G/ZIF-8 (brown solid-line), GO (yellow-brown dot-line), GO/ZIF-8 (yellow-brown dash-line), and PVP-GO/ZIF-8 (yellow-brown solid-line).
Fig. S5 XRD patterns of the ZIF-8 (blue solid-line), CNT (black dot-line), CNT/ZIF-8 (black dash-line), PVP-CNT/ZIF-8 (black solid-line), graphene (brown dot-line), G/ZIF-8 (brown dash-line), PVP-G/ZIF-8 (brown solid-line), GO (yellow-brown dot-line), GO/ZIF-8 (yellow-brown dash-line), and PVP-GO/ZIF-8 (yellow-brown solid-line).
Fig. S6 SEM images of the PVP-CNT/ZIF-8s collected after the \textit{in situ} synthesis of the ZIF-8 for (A) 15, (B) 60, and (C) 240 min. Scale bars: 100 nm.
Fig. S7 TGA of the (A, blue line) PVP-CNT/ZIF-8, (A, red line) CNT/ZIF-8, (A, black line) CNT, (B, blue line) PVP-G/ZIF-8, (B, red line) G/ZIF-8, (B, black line) graphene, (C, blue line) PVP-GO/ZIF-8, (C, red line) GO/ZIF-8, and (C, black line) GO. TGA of the ZIF-8 (gray line) was expressed as a comparison.
**Fig. S8** TGA showing mass changes due to the adsorption and desorption of CO2 gases obtained from the PVP-GO/ZIF-8 (blue line), GO/ZIF-8 (red line), and GO (black line) at the temperatures of 70, 55, 40 and 25 °C.