論文 / 著書情報
Article / Book Information

論題(和文)	Disassembly reaction of the ferritin cage observed by high-speed AFM
Title(English)	Disassembly reaction of the ferritin cage observed by high-speed AFM
著者(和文)	MAITY BASUDEV, Zhipeng LI, Kento NIWASE, Diannan LU, 上野 隆史
Authors(English)	Basudev Maity, Zhipeng LI, Kento NIWASE, Diannan LU, Takafumi UENO
出典(和文)	日本化学会年会講演予稿集, ,
Citation(English)	, ,
発行日 / Pub. date	2020, 3
Note	このファイルは著者（最終）版です。 This file is author (final) version.

Disassembly reaction of the ferritin cage observed by high-speed AFM

([1]*School of Life Science and Technology, Tokyo Institute of Technology*, [2]*Department of Chemical Engineering, Tsinghua University*) ○Basudev Maity,[1] Zhipeng Li,[2] Kento Niwase,[1] Diannan Lu,[2] Takafumi Ueno*[1]

Keywords: Ferritin cage, Disassembly process, High-speed AFM, MD simulations

Ferritin is a naturally occurring iron storage protein consisting of 24 identical subunits which form a spherical cage with an internal cavity of diameter 8 nm. The internal space of the apo-ferritin cage can accommodate synthetic molecules, metal ions and nanoparticles which find important applications in medicine, catalysis and material science including synthesizing monodisperse nanoparticles.[1] The apo-ferritin cage can be dissemble and reassemble by controlling pH which enable to incorporate larger molecules into the cage. Therefore, understanding the fundamentals of ferritin cage disassembly is significant from the viewpoint of designing the cage for wilder applications. Although there are several reports which described the pH-induced ferritin cage disassembly, the detailed mechanism with initiation of the process and intermediate states are not yet elucidated.[2,3] This presentation will describe the direct visualization of apo-ferritin cage disassembly at single-molecule level in solution by high-speed AFM (HS-AFM) which has been proven to be powerful tool for visualization of biomolecular actions.[4] The HS-AFM captures the snapshots of the dynamic event in milliseconds intervals which revealed the expansion of ferritin cage with formation of holes before disassembly into subunits. Such observations were further reinforced by the all-atom MD simulations which reveal the initiation of the process by opening of the 3-fold symmetric channel as a hole and consistent with the HS-AFM results. Such interesting observations are particularly important for designing ferritin cage for developing functional biomaterials and the fundamental understanding would be applied to other protein assembly.

1) G. Jutz, P. van Rijn, B. Santos Miranda, A. Böker, *Chem. Rev.* **2015**, *115*, 1653.

2) M. Kim, Y. Rho, K. S. Jin, B. Ahn, S. Jung, H. Kim, M. Ree, *Biomacromolecules* **2011**, *12*, 1629.

3) D. Sato, H. Ohtomo, Y. Yamada, T. Hikima, A. Kurobe, K. Fujiwara, M. Ikeguchi, *Biochemistry* **2016**, *55*, 287.

3) T. Ando, T. Uchihashi, S. Scheuring, *Chem. Rev.* **2014**, *114*, 3120.