

金ナノ粒子結合による溶液表面における光捕捉誘起 α シヌクレイン液滴形成の促進
**Enhancement of Optical Trapping-Induced α -Synuclein Condensate Formation
 at Solution Surface by Gold Nanoparticle Conjugation**

National Yang Ming Chiao Tung Univ., Taiwan¹, Kobe Univ., Japan²

◦Keisuke Yuzu^{1,2}, Eri Chatani², Hiroshi Masuhara¹

E-mail: yuzu@nycu.edu.tw

Optical trapping, a technique to manipulate micro- and nanoparticles by mechanical force with a focused laser, has been developed in various research fields from optics to biology. Based on optical trapping, we have studied on optically evolved assembly of nanoparticles on solution surface, where nanoparticles assemble and grow beyond the laser focus area¹. We have previously discovered that lysozyme forms concentrated assembly in a supersaturated solution by optical trapping at solution surface², even though protein molecules are typically too small for optical trapping. In addition, we have recently found the optical trapping-induced formation of a single liquid-like condensate of α -synuclein at solution surface in its unsaturated condition³. Here, we attempted a more effective α -synuclein condensate formation by conjugating gold nanoparticles (Au NPs), which have high polarizability due to surface plasmon resonance and are thus strongly optically trapped. In the presence of 10 nm Au NP-conjugated α -synuclein, condensate was formed with a lag time of approximately 30 sec by optical trapping. In contrast, without conjugation, a lag time of approximately 300 sec was required (Figure 1). Moreover, the condensate formed unstably and immediately deformed in the presence of free gold nanoparticles. These observations suggest that the conjugation of Au NPs is effectively promotes stable condensate formation.

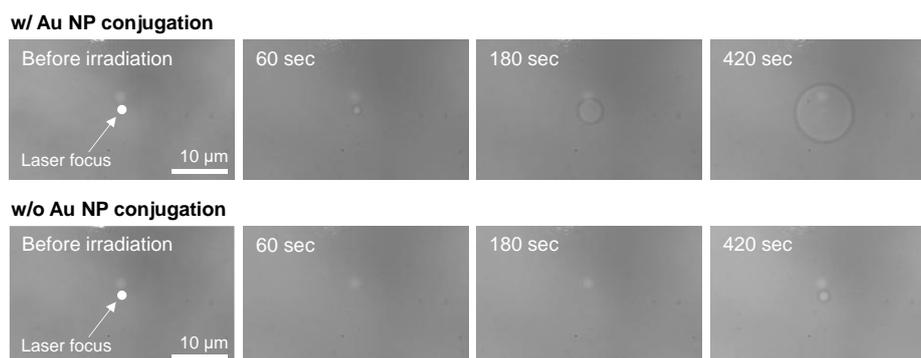


Figure 1. Transmission images of α -synuclein condensate formation by optical trapping at solution surface in the presence and absence of 1×10^{-5} % 10 nm Au NP-conjugated α -synuclein. Sample solutions containing 200 μ M α -synuclein, 25 mM Tris-DCI (pD 7.4), 100 mM NaCl and 7.5% PEG.

References

1. Masuhara and Yuyama, *Annu. Rev. Phys. Chem.* **72**, 565-589 (2021)
2. Yi et al., *J. Phys. Chem. C* **125**, 18988-18999 (2021)
3. Yuzu et al., *Proc. Natl. Acad. Sci. U.S.A.* **121**, e2402162121 (2024)