Surface Plasmon Resonance Microscopy (SPRM) of photothermal liposomes: detection of encapsulated nanoparticles inside the liposomes

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Photothermally driven drug release from liposomal drug delivery systems can be obtained by adding gold nanoparticles (AuNPs) into the cavity of the liposomes [1]. In terms of producing such systems, one of the most important parameters is the encapsulation efficiency (EE) that is normally determined by e.g. cryo-TEM or by fluorescence after breaking the liposomes with a non-ionic surfactant, such as Triton X-100. In this work, we show that the AuNP EE can be determined with surface plasmon resonance microscopy (SPRM) in room temperature without interfering the system with any additives. The EE is obtained by measuring a set of single liposome binding SPRM intensities and scattering patterns on the surface. Resulting cumulative distribution function (CDF) shows two statistically relevant binding types in the case of liposomes with AuNPs (that were not visible by themselves) whereas only one binding type is detected in the case of bare liposomes (see Fig 1).

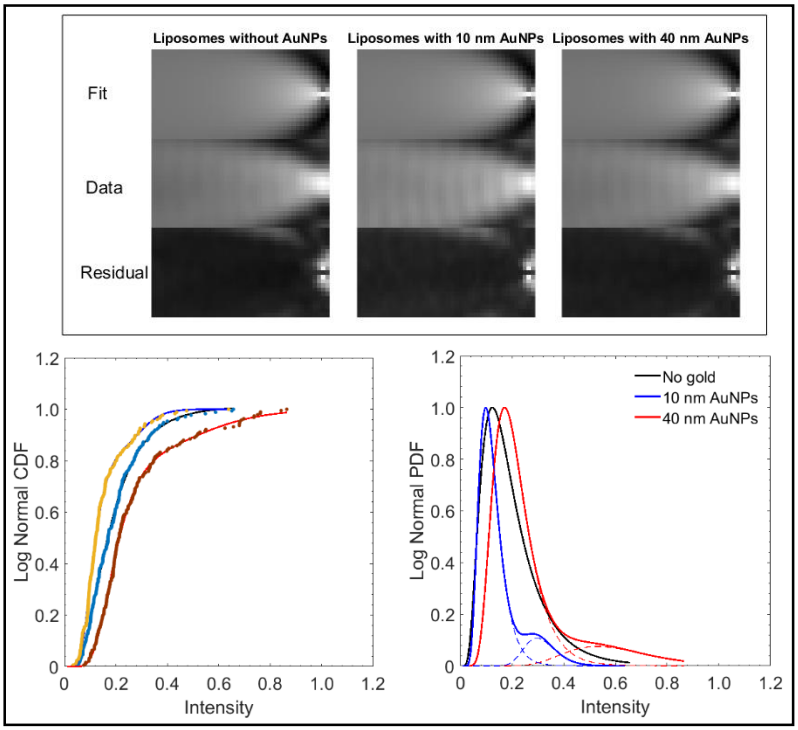

Figure 1. Upper figures, averaged responses of liposomes with and without gold nanoparticles binding on MUAM functionalized gold surface in SPRM. Bottom left, dots represent the measured intensities shown as a cumulative distribution function (CDF). Lines are the respective fits that are used to calculate the lognormal probability density functions (PDF) in the bottom right figure.

Acknowledgements The financial support of Academy of Finland is acknowledged for funding via the Programmable Materials Program ”Light Triggered Nanoparticles” (OMA, #263453).

[1] Lajunen, T.; Viitala, L.; Kontturi, L.; Laaksonen, T.; Liang, H.; Vuorimaa-Laukkanen, E.; Viitala, T.; Le Guével, X.; Yliperttula, M.; Murtomäki, L.; Urtti, A. *J. Controlled Release* 2015, **203**, 85.