

Determining the laser-induced release probability of a nanoparticle from a soft substrate: supplement

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Supplement DOI: <https://doi.org/10.6084/m9.figshare.21440583>

Parent Article DOI: <https://doi.org/10.1364/OL.475174>

Supplementary Material

Determining the laser-induced releasing probability of a nanoparticle from a soft substrate

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Fig. S1 illustrates the schematic of the experimental setup. A CW laser ($\lambda=1064$ nm) is first expanded by using a beam expander to overfill the back aperture of an oil immersion objective lens (NA=1.45, 100 \times). And then it is focused on a sample containing gold nanospheres on a PMMA substrate. A quarter-wave plate (QWP) is used to convert the laser polarization from linear polarization to circular polarization to obtain a circular focal spot and symmetric nanoparticle heating. The laser is switched ON and OFF by a liquid crystal shutter (LCS). The sample (donor substrate) is placed on a translation stage (TS1). An ITO-coated glass substrate (receiver substrate) is mounted on another translation stage (TS2) and placed above the donor substrate. Two cameras (CCD1 and CCD2) are used to image the donor and the receiver substrate, respectively. The laser power can be adjusted with a variable power attenuator and monitored on a power meter. An LED light source is used to illuminate the system.

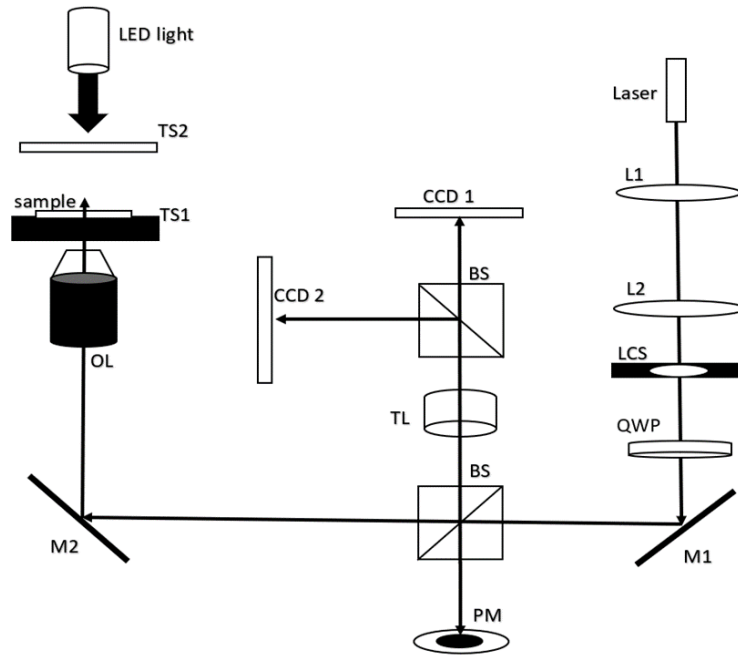


Fig. S1. Schematic of the experimental setup. BS: beam splitter. TL: tube lens. M1 and M2: reflective mirror. PM: power meter. OL: objective lens. LCS: liquid crystal shutter. QWP: quarter wave plate.

Dataset 1

The raw data for Figure 2 and Figure 3 are listed in the table below. Figures 2 and 3 are plotted based on these data.

Table S1 Releasing probability of different sizes of nanospheres

100nm Nanosphere							
Intensity (mW/ μm^2)	0	10	20	24	29	34	36
probability	0 \pm 0%	0 \pm 0%	0 \pm 0%	2% \pm 2%	12% \pm 2%	24% \pm 4%	46% \pm 4%
Intensity	39	43	48	58	68	78	87
Probability	66% \pm 3%	86% \pm 4%	92% \pm 2%	94% \pm 2%	94% \pm 2%	95% \pm 1%	96% \pm 0%
150nm Nanosphere							
Intensity	0	5	10	15	18	20	22
probability	0 \pm 0%	0 \pm 0%	0 \pm 0%	10% \pm 2%	21% \pm 3%	32% \pm 4%	45% \pm 3%
Intensity	25	29	35	40	44	53	63
Probability	70% \pm 4%	86% \pm 3%	96% \pm 2%	96% \pm 2%	95% \pm 1%	96% \pm 1%	96% \pm 1%
Intensity	73	82	92				
Probability	98% \pm 1%	97% \pm 1%	98% \pm 0%				
200nm Nanosphere							
Intensity	0	5	9	10	11	12	13
probability	0 \pm 0%	0 \pm 0%	8 \pm 2%	27% \pm 4%	39% \pm 4%	68% \pm 3%	85% \pm 2%
Intensity	15	20	25	35	44	54	63
Probability	91% \pm 1%	94% \pm 2%	97% \pm 1%	97% \pm 0%	96% \pm 1%	97% \pm 1%	97% \pm 1%
Intensity	73	82	92				
Probability	98% \pm 1%	98% \pm 1%	98% \pm 0%				
250nm Nanosphere							
Intensity	0	2	5	7	8	10	12
probability	0 \pm 0%	0 \pm 0%	16 \pm 1%	48% \pm 2%	66% \pm 3%	84% \pm 4%	91% \pm 3%
Intensity	16	26	31	40	48	60	70
Probability	93% \pm 2%	93% \pm 3%	95% \pm 3%	96% \pm 2%	98% \pm 1%	98% \pm 1%	98% \pm 1%
Intensity	80	90					
Probability	98% \pm 1%	98% \pm 0%					

Table S2 Releasing probability under different surface conditions

			Negatively charged				
No plasma cleaned							
Intensity (mW/ μm^2)	0	5	8	10	14	19	24
Probability	0 \pm 0%	2% \pm 2%	8% \pm 4%	16% \pm 2%	28% \pm 4%	48% \pm 4%	64% \pm 3%
Intensity	29	34	39	44	48	58	68

Probability	78%±6%	90%±4%	94%±2%	96%±2%	96%±1%	96%±1%	96%±2%
Plasma cleaned							
Intensity	5	10	14	19	24	29	34
Probability	0±0%	0±0%	2%±2%	6%±3%	12%±4%	20%±3%	42%±4%
Intensity	38	43	48	53	58	63	68
Probability	58%±3%	70%±3%	82%±4%	90%±2%	92%±1%	94%±2%	94%±1%
			Positively charged				
No plasma cleaned							
Intensity	5	10	14	19	24	29	34
Probability	0±0%	2%±0%	18%±2%	42%±3%	64%±4%	80%±3%	88%±4%
Intensity	38	43	48	58	68		
Probability	94%±3%	94%±3%	96%±2%	96%±2%	96%±1%		
Plasma cleaned							
Intensity	5	10	14	19	24	29	34
Probability	0±0%	0±0%	2%±0%	10%±2%	14%±3%	22%±4%	42%±3%
Intensity	38	43	48	53	58	63	68
Probability	54%±4%	64%±3%	86%±3%	92%±4%	92%±2%	94%±1%	94%±2%

Table S3 Releasing probability on PMMA, PDMS and PVC

PMMA							
Intensity (mW/μm ²)	0	5	10	12	14	19	24
probability	0±0%	2%±2%	16%±4%	32%±2%	46%±4%	64%±4%	78%±3%
Intensity	29	34	39	44	48	58	
probability	92%±2%	94%±3%	96%±2%	96%±2%	96%±1%	96%±1%	
PDMS							
Intensity	0	5	10	12	14	19	24
probability	0±0%	6%±2%	26%±3%	42%±2%	54%±4%	74%±4%	86%±3%
Intensity	29	34	39	44	48	58	
probability	92%±2%	96%±3%	96%±2%	96%±2%	96%±2%	96%±1%	
PVC							
Intensity	0	5	10	12	14	19	24
probability	0±0%	0±1%	4%±3%	16%±3%	30%±4%	52%±3%	62%±4%
Intensity	29	34	39	44	48	58	
probability	72%±3%	80%±3%	84%±3%	86%±2%	88%±1%	86%±1%	