Electronic Supplementary Material (ESI) for RSC Advances

Support information:

Figure S1 shows the emission fluorescence spectra of Nile red-loaded PNDDS of all particle sizes with the excitation wavelength of 549 nm. The spectra had a maximum at a wavelength varying from 610 nm to 640 nm depending on the size of PNDDS. This variation was presumably due to the differences in average intermolecular distances between Nile red molecules for each formulation and the presence of polystyrene molecules.

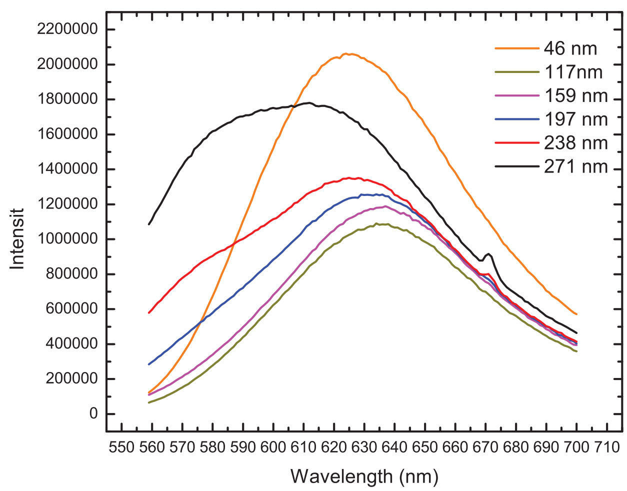


Figure S1. Emission fluorescence spectra of PNDDS of different sizes. The emission maxima were recorded at the wavelength varying from 610 nm to 640 nm depending on the formulations used to create PNDDS.

To determine the relationship between the emission fluorescence maxima and PNDDS concentration, PNDDS of all sizes were diluted into 0.5, 0.25, and 0.1 times their initial concentrations, and their emission maxima were measured by SFM. Figure S2 shows the linear fit results of emission maxima of PNDDS versus the concentrations of PNDDS. It shows that the emission maxima are proportional to the concentration of PNDDS of all particle sizes. With these obtained fit equations, the concentrations of PNDDS during uptake experiment for all times were calculated as a function of time.

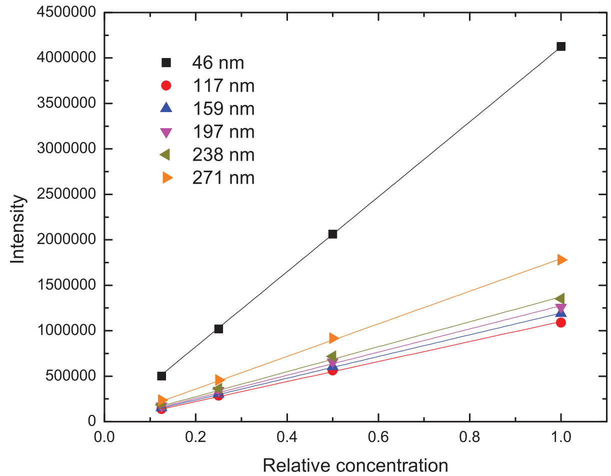
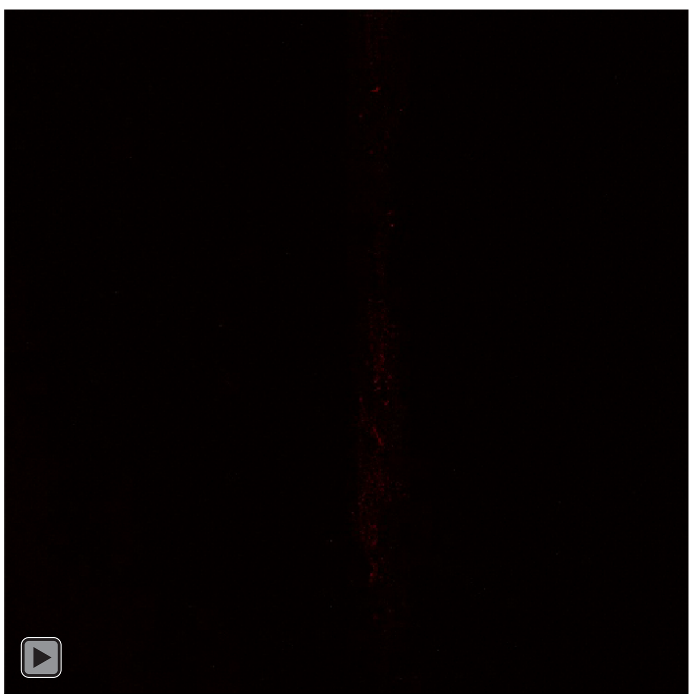


Figure S2. Linear fit of the SFM maximum intensity versus concentration of PNDDS. All PNDDS show good linear fit. The fit equation is used to determine the concentration of PNDDS during uptake experiments.

Movie S1 shows confocal microscopy images focusing on the different planes of a root after dipping it in 159-nm PNDDS solution for 81 hrs. The movie clearly reveals that PNDDS not only adsorb onto the root surface, but also uptake into root interior.



Movie S1. Confocal microscopy images focusing on the different planes of a root after dipping it in 159-nm PNDDS solution for 81 hrs.

Tables S1 and S2 show the fit result of k_a and $\Gamma^* k_{up}$ obtained when Γ^* = 0.8 and 0.4 g/m^2. By comparing these two tables to Table 2 in the main text, we can see that regardless of the choice of Γ^* value (Γ^* = 0.4, 0.6, or 0.8 g/m^2), k_a and k_{up} gave rise to similar order of magnitudes; and k_{up} increased with decreasing PNDDS size.

Table S1. Fit results of k_a, k_{up} and $\Gamma^* k_{up}$ with Γ^* = 0.8

Diameter (nm)	k_a (m/hr)	k_{up} (1/hr)	$k_a m_{s,0}$ (g/(m^2·hr))	$\Gamma^* k_{up}$ (g/(m^2·hr))
46	0.0046	0.1386	0.6118	0.1123
117	0.0018	0.0764	0.2394	0.0619
159	0.0014	0.0333	0.1862	0.0270
197	0.0009	0.0232	0.1197	0.0188
238	0.0015	0.0184	0.1995	0.0149
271	0.0018	0.0031	0.2394	0.0025

Table S2. Fit results of k_a, k_{up} and $\Gamma^* k_{up}$ with Γ^* = 0.4

Diameter (nm)	k_a (m/hr)	k_{up} (1/hr)	$k_a m_{s,0}$ (g/(m^2·hr))	$\Gamma^* k_{up}$ (g/(m^2·hr))
46	0.0325	0.2432	4.3225	0.1970
117	0.0046	0.1433	0.6118	0.1161
159	0.0033	0.0799	0.4389	0.0647
197	0.0014	0.0663	0.1862	0.0537
238	0.0044	0.0566	0.5852	0.0458
271	0.0030	0.0339	0.3990	0.0275