Electronic Supplementary Information† (ESI†)

Development and investigation of multi-layered homo- and hetero-type DNA thin films†

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**Fig. S1.** Representative data of optical constants (indicated by dotted lines) of single-, double-, and triple-layered DNA thin films (D) and CTMA-modified DNA thin films (C) obtained from a spectroscopic ellipsometry and corresponding curve fittings (marked with solid lines) by Cauchy dispersion relation. The ellipsometry raw data curves obtained as Del (Δ indicated as red) and Psi (ψ as blue) are fitted by Cauchy dispersion relations of $n(\lambda) = A + B/\lambda^2 + C/\lambda^4$ and $k(\lambda) = D + E/\lambda^2 + F/\lambda^4$, respectively. Here, $n, k$ are wavelength ($\lambda$)-dependent refractive index (orange-coloured solid line), and extinction coefficient (navy-blue solid line), and A, B, C, D, E and F are curve fitting constants obtained after fitting. While the curve fitting, the mean square errors are relatively lesser for thinner films than thicker films due to the absorption amount of UV light.
Fig. S2. Representative loading and unloading force curves as a function of thin film’s depth (left) and corresponding analysis results of hardness, modulus, and elasticity (right) of single-, double-, and triple-layered DNA thin films (D) and CTMA-modified DNA thin films (C).

Fig. S3. Normalized absorbance and photoluminescence (PL) spectra of aqueous dispersed YOYO, a-QDB, a-QDG, a-QDR and organic dispersed CMR, R6G, CVP and QDB, QDG, QDR luminophore solutions. The PL emission spectra are measured at a fixed excitation wavelength of 365 nm and the characteristics PL emission peaks are indicated by the vertical dotted lines. (a) Normalized absorbance spectra of organic dispersed QDB, QDG, QDR (indicated by solid line) and aqueous dispersed a-QDB, a-QDG, a-QDR (dashed line) solutions. The peak shows the characteristics of QDs which is capable to continuously absorb the energy of shorter wavelength (i.e. presence of higher order excitation level). The inset shows the photographic images of PL emission while exciting the samples by an UV lamp with wavelength of 365 nm. (b) Normalized PL spectra of organic dispersed QDB, QDG, QDR (indicated by solid line) and aqueous dispersed a-QDB, a-QDG, a-QDR (dashed line) solutions. The PL peak represents the salient feature of QD’s sharp and narrow full width at half maximum (FWHM) emission characteristics for first order and higher order excitations. The FWHM are 22, 32, 38, and 36 nm for QDB, QDG, QDR, and a-QDR, respectively at the fixed excitation of 365 nm. (c, d) Normalized absorbance (solid lines) and PL spectra (dotted lines) of aqueous dispersed YOYO, and organic dispersed CMR, R6G, CVP luminophores and the FWHM are 94, 45, 35, 41 nm, respectively at the fixed excitation of 365 nm.