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Directed growth of calcein/nile-red coaxial nanowire arrays via two-step dip-coating approach

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Figure S1. Top view scanning electron microscopy (SEM) images of aligned a) calcein nanowire (NW) and b) calcein/nile-red CNW arrays through one and twice dip-coating process, respectively.



Figure S2. Precisely positioning organic coaxial nanowire (CNW) arrays can be generated through a two-step dip-coating technique and facile to transfer onto a flat polydimethylsiloxane (PDMS) film. (a) Optical and (b) in-site fluorescent micrographs of calcein/nile-red CNW arrays upon a PDMS film under 325 nm centered UV irradiation. Each 1D nanoarchitecture was uniform and regularly positioned towards one direction.



Figure S3. The overlapped energy band between absorption spectra of nile red and emission spectra of calcein indicated possible energy transfer from calcein to nile red molecules, yielding a fluorescence resonance energy transfer (FRET) behavior. Purple and pink curves are ultraviolet (UV) absorption spectrums of calein and nile red molecules, respectively. Green and orange curves are photoluminescence (PL) spectrums of calein and nile red molecules, respectively. The overlapped wavelength region between *ca.* 496 nm to 571 nm indicated the possibility of a FRET behavior contributed by energy transfer from calcein core to nile red sheathing layers inside CNWs.



Figure S4. Coaxial calcein/nile-red linear structures lead to fluorescence resonance energy transfer (FRET) behavior due to a close contact between calcein donor core and nile red acceptor sheathing layer. Fluorescent micrographs of (a) calcein NW and (b) calcein/nile-red CNW arrays under 325 nm centered UV irradiation. Oriented calcein NWs showed green fluorescent light. Since nile red molecules can not be excited by ultra-UV light in this wavelength region, the calcein/nile-red CNWs should remain green fluorescence, however, exhibit orange type, indicating a FRET behavior appearing inside CNWs.



Figure S5. Nile-red/calcein CNW arrays with alternative core/sheath composites could be generated by tailoring the coating sequence in this two-step dip-coating technique. (a) Schematic illustration of generating nile-red/calcein CNW arrays. A superhydrophobic square-pillar structured silicon substrate was immersed in a nile-red solution (0.01 wt%), and then slowly pulled out at a constant speed (*ca.* 0.01 mm/s), yielding nile-red NW arrays. Then, the NW-loading silicon substrate repeated the same performance inside calcein liquor (0.01 wt%), yielding regular nile-red/calcein CNW arrays. A flexible PDMS film was pressed to contact the silicon substrate for two minutes and then peeled off, allowing these CNW arrays transferred onto the flat substrate. Fluorescent micrographs of (b) nile red NW and (c) nile-red/calcein CNW arrays under 325 nm centered UV irradiation. Nile red NWs exhibited no fluorescence but suddenly showed yellowish green color after coated with a calcein sheathing layer. (d) Photoluminescence (PL) spectrums of nile-red/calcein CNW arrays, two peaks appeared in the curve, indicating calcein and nile red molecules have all been excited. (e) Different from calcein/nile-red CNWs, calcein sheathing layer in this case would directly release green fluorescence and transfer energy to nile red core at the same time when exposed to UV irradiation. Thus, a simple self-excitation and a FRET process coexisted in as-prepared CNWs.



Figure S6. Schematic illustration of beads-shaped nile-red/calcein CNWs serving as a selectively chemical sensor. Such 1D nanostructure was fixed under the object lens of a optical microscopy. A beam of continuous fog containing diverse compounds (10^{-5} wt\%) was forced to spray towards the bead-shaped CNWs for 30 seconds. Then, the fluorescence change of bead-shaped CNWs was investigated after total evaporation of water (*ca.* 120 seconds). The whole system was performed in a closed cage in order to prevent the escape of detected compounds.