Supporting Information

A Novel Photothermo-Responsive Nanocarrier for the Controlled Release of Low-Volatile Fragrances

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1. Determination of Loading contents of Sandalore (SA) and PDA coating

In the present work, the loading contents (LC) of SA and PDA coating in the as-prepared NPs were estimated by combining the thermogravimetric and elemental analysis. This is because the TGA profiles only show the total weight loss, which corresponding to the total mass of SA and PDA contained in a particular sample SA/MSN@PDA. However, it is difficult to determine the individual percentage of SA and PDA based on the TGA curve. According to the molecular mechanism for the formation of polydopamine [Ref.1-3], the polymer skeleton consists of repeating units with an indole motif. The molecular formula of the repeating units can be expressed as $C_8H_5NO_2$. Thus, the composition of nanocomposites was calculated by Equation (1) and (2) based on the results of thermogravimetric and elemental analyses.

$$\text{PDA (\%)} = N\,\% \times 147/14 \qquad (1)$$

$$W_{TGA}\,(\%) = \text{SA (\%)} + \text{PDA (\%)} \qquad (2)$$

where, N % refers to the percentage of nitrogen atoms obtained by elemental analysis, 147 and 14 are the formula weight of PDA repeating unit ($C_8H_5NO_2$) and the nitrogen atomic weight respectively. In Equ.2, W_{TGA} (%) is the total weight loss percentage of a specific sample obtained in TGA, which represents the sum of SA% and PDA %. Thus, W_{TGA} (%) minus PDA % leads to SA%. Percentages are indicated in % by weight.

As noted in the text, the as-prepared NPs were denoted as SA_x/MSN@PDA_y, where x is the integer value of LC (SA %) and y represents the mass percent of PDA layer relative to silica rather than to the composite. Table S1 summarizes the data from TGA and EA as well as the related parameters obtained thereby.

Table S1. Data from thermogravimetric and elemental analysis for the NPs

entry	Sample code SD_x/MSN@PDA_y	*N* %	*C* %	*O* %	PDA (%)	W_{TGA} (%)	SA (%)	*y* (%)
1	MSN@$PDA_{12.5}$	1.06	8.21	1.56	11.13	–	N/A	12.5
2	SD_{47}/MSN@$PDA_{1.1}$	0.06	37.91	6.06	0.63	47.6	46.97	1.1
3	SD_{43}/MSN@$PDA_{3.9}$	0.20	35.54	5.54	2.1	44.8	42.7	3.9
4	SD_{48}/MSN@$PDA_{5.3}$	0.24	39.55	6.19	2.52	50.2	47.68	5.3

2. Supplementary data

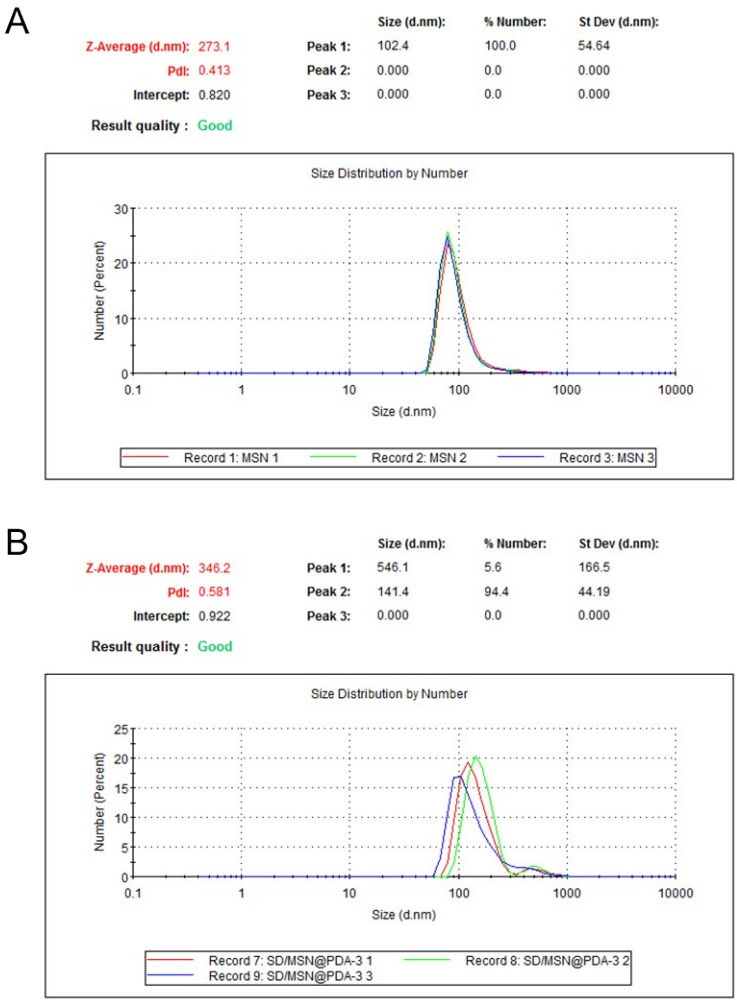
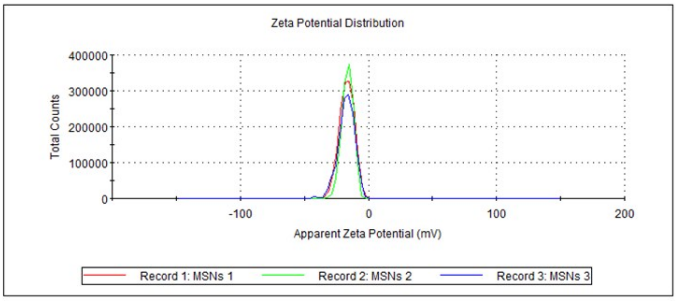


Figure S1. DLS curves of (A) MSNs, (B) SA_{48}/MSN@$PDA_{5.3}$.

A

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -17.2	Peak 1:	-17.1	99.5	6.10
Zeta Deviation (mV): 6.27	Peak 2:	-41.0	0.5	1.54
Conductivity (mS/cm): 0.00320	Peak 3:	0.00	0.0	0.00

Result quality : Good



B

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -13.1	Peak 1:	-13.1	100.0	4.91
Zeta Deviation (mV): 4.91	Peak 2:	0.00	0.0	0.00
Conductivity (mS/cm): 0.00332	Peak 3:	0.00	0.0	0.00

Result quality : Good

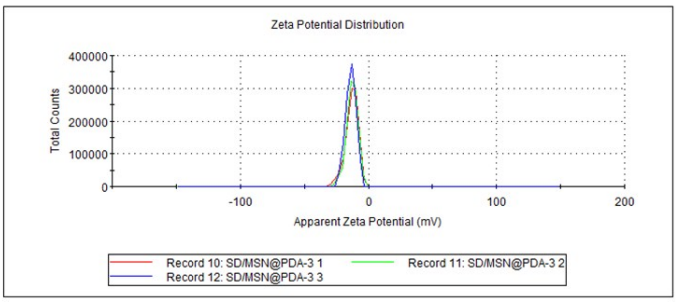


Figure S2. Zeta potential of (A) MSNs, (B) SA_{48}/MSN@$PDA_{5.3}$.

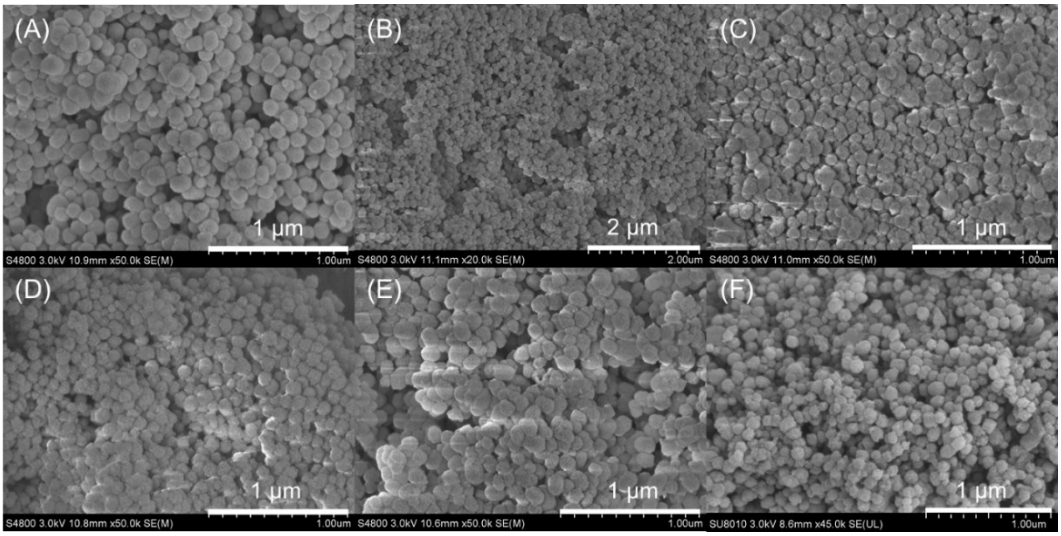


Figure S3. SEM images of (A) MSNs, (B) SA_{46}/MSN, (C) SA_{47}/MSN@$PDA_{1.1}$, (D) SA_{43}/MSN@$PDA_{3.9}$, (E) SA_{48}/MSN@$PDA_{5.3}$, and (F) MSN@$PDA_{12.5}$.

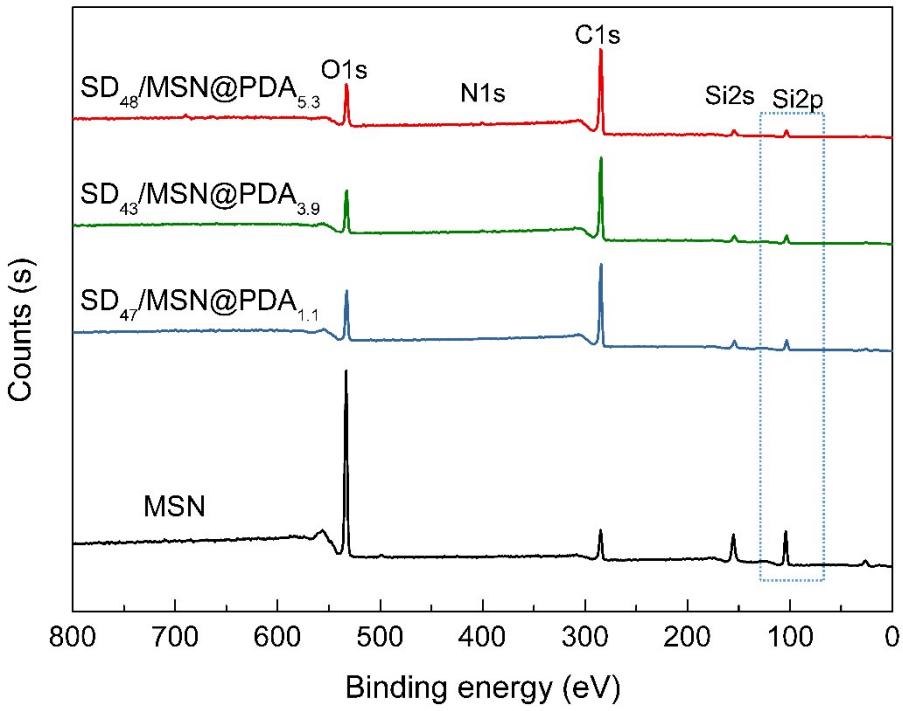


Figure S4. XPS spectra of pristine MSNs and composite NPs (for fitted N1s signals and enlarged Si2p spectra see Figure 2 in the text).

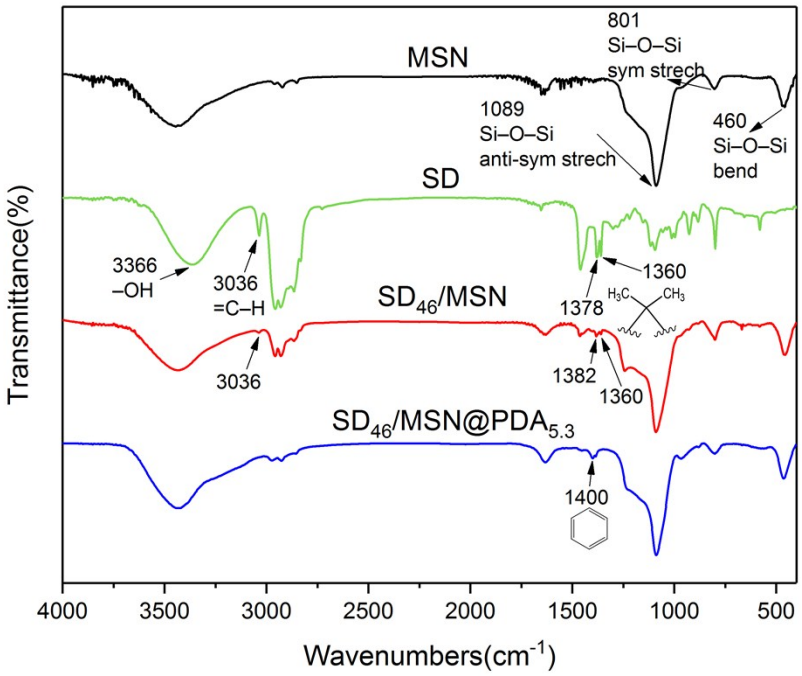


Figure S5. FT-IR spectra of MSNs, SA, SA_{46}/MSN, and SA_{47}/MSN@$PDA_{5.3}$.

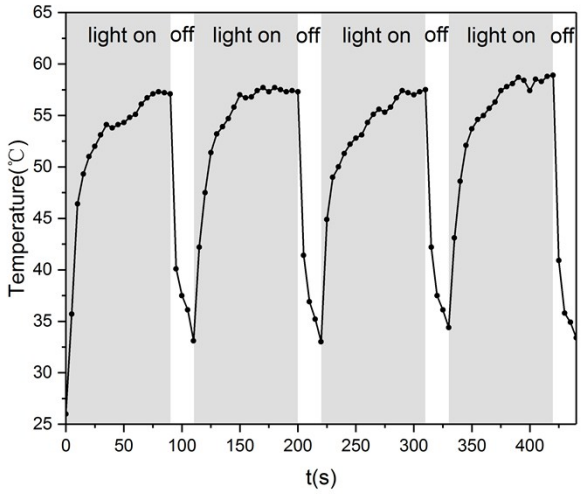


Figure S6. Changes in the temperature of the sample SA_{48}/MSN@$PDA_{5.3}$ (10 mg, heaped into a thin layer of ~10 mm × 10 mm × 1 mm) when a simulated sunlight was periodically turned on and off (100 mW cm^{-2}).

Ref.

[1] Y. Liu, K. Ai and L. Lu, Polydopamine and its derivative materials: Synthesis and promising applications in energy, environmental, and biomedical fields, *Chem. Rev*., 2014, **114**, 5057–5115.

[2] A. Postma, Y. Yan, Y. Wang, A. N. Zelikin, E. Tjipto and F. Caruso, Self-polymerization of dopamine as a versatile and robust technique to prepare polymer capsules, *Chem. Mater.*, 2009, **21**, 3042–3044.

[3] F. Bernsmann, V. Ball, F. Addiego, A. Ponche, M. Michel, J. J. D. A. Gracio, V. Toniazzo and D. Ruch, Dopamine-melanin film deposition depends on the used oxidant and buffer solution, *Langmuir*, 2011, **27**, 2819–2825.