Electronic Supplementary Information (ESI)

for

Core-shell structured microneedles with programmed drug release functions for prolonged hyperuricemia mangement

Rui Wang [a,b], Yanfang Sun [c,*], Han Wang [d], Tianqi Liu [a,b], Amin Shavandi [e], Lei Nie [f], Khaydar E. Yunusov [g], Guohua Jiang [a,b,*]

[a] *School of Materials Science and Engineering, Zhejiang Sci-Tech University, Hangzhou, 310018, China*

[b] *International Scientific and Technological Cooperation Base of Intelligent Biomaterials and Functional Fibers, Hangzhou, 310018, China*

[c] *College of Life Sciences and Medicine, Zhejiang Sci-Tech University, Hangzhou, Zhejiang, 310018, China*

[d] *Wenzhou Institute, University of Chinese Academy of Sciences, Wenzhou, China*

[e] *BioMatter unit-École polytechnique de Bruxelles, Université Libre de Bruxelles, Brussels, Belgium*

[f] *College of Life Science, Xinyang Normal University, Xinyang 464000, China*

[g] *Institute of Polymer Chemistry and Physics, Uzbekistan Academy of Sciences, Tashkent, 100128, Uzbekistan*

E-mail: katherineyfs@zstu.edu.cn (Y. Sun); ghjiang_cn@zstu.edu.cn (G. Jiang)

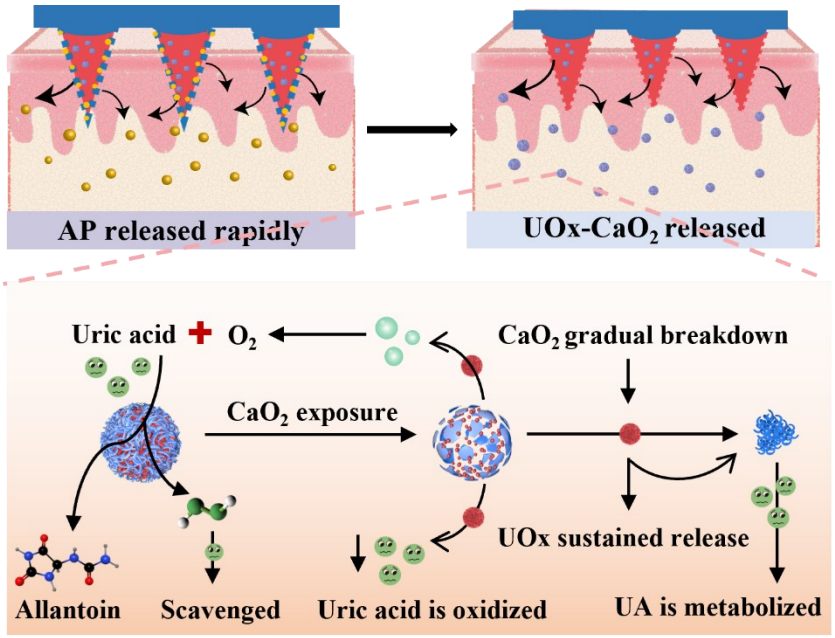

Figure S1. The release kinetics of drug's behavior *in vivo*

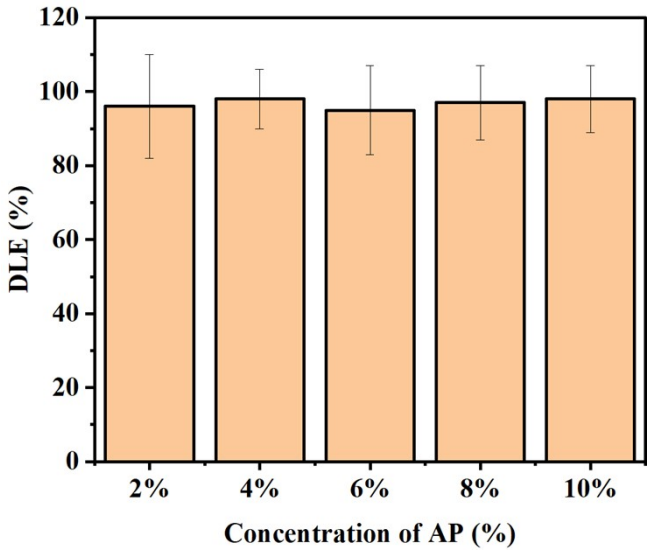

Figure S2. The drug loading efficiency of all prepared MNs

The loading amount of UOx was determined by a UV spectrophotometer at 280 nm (TU-1901, Beijing Purkinje General Instrument Co., Ltd, China). The encapsulation efficiency (EE) and loading capacity (LC) of UOx were calculated as follows:

$$EE = (W_{total\ UOx} - W_{supernatant\ UOx}) / (W_{total\ UOx}) \times 100\% \quad (1)$$

$$LC = (W_{total\ UOx} - W_{supernatant\ UOx}) / (W_{total\ particle}) \times 100\% \quad (2)$$

where $W_{total\ UOx}$ is the total weight of UOx; $W_{supernatant\ UOx}$ is the weight of UOx in supernatant; $W_{total\ particle}$ is the weight of UOx-CaO_2.

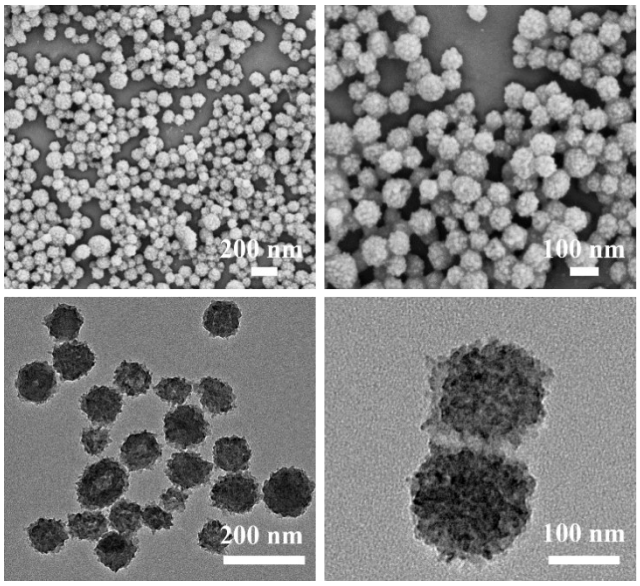

Figure S3. SEM and TEM images of CaO_2.

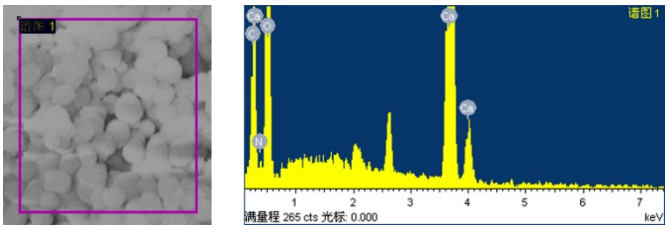

Figure S4. EDS spectrum of CaO_2.

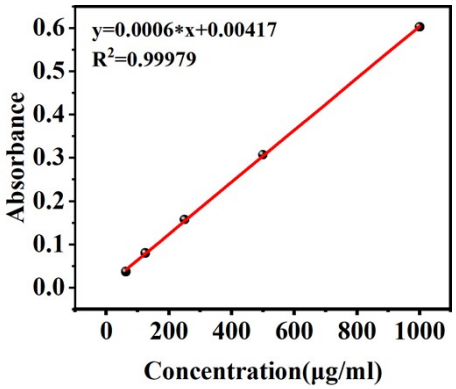

Figure S5. Standard curve of UOx.

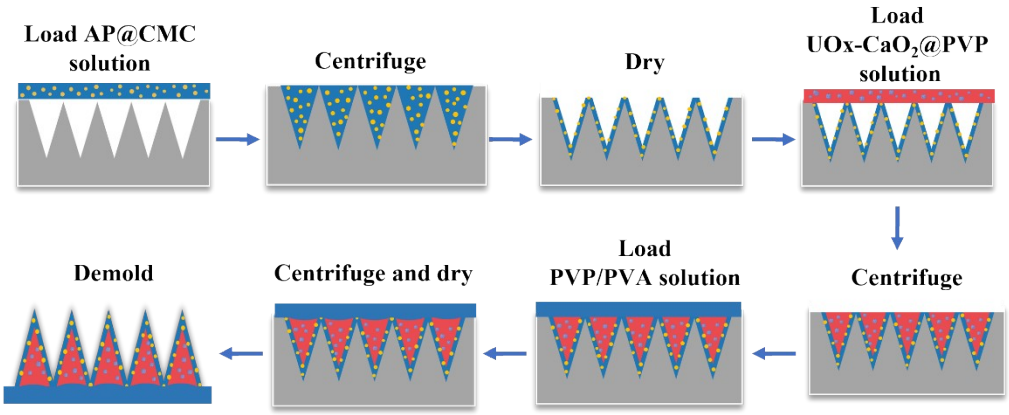

Figure S6. Schematic illustration of the fabrication of the core-shell MN patch.

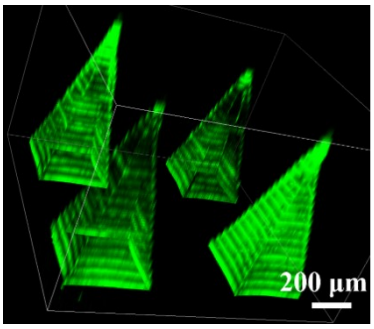

Figure S7. Confocal image of core-only MN arrays.

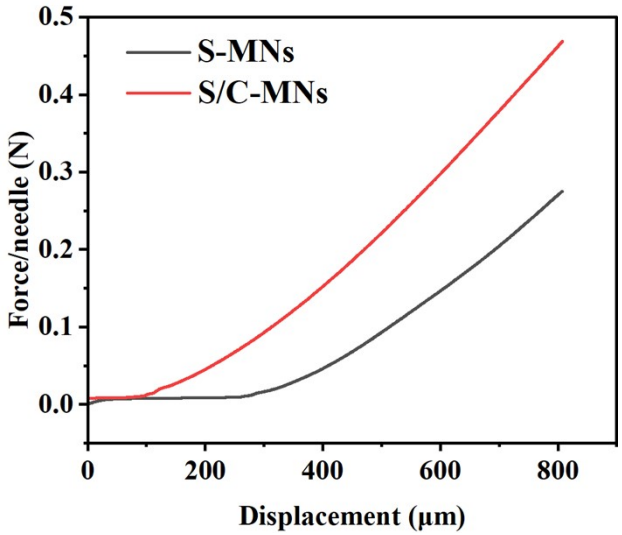

Figure S8. Force-displacement image of core-shell MNs.

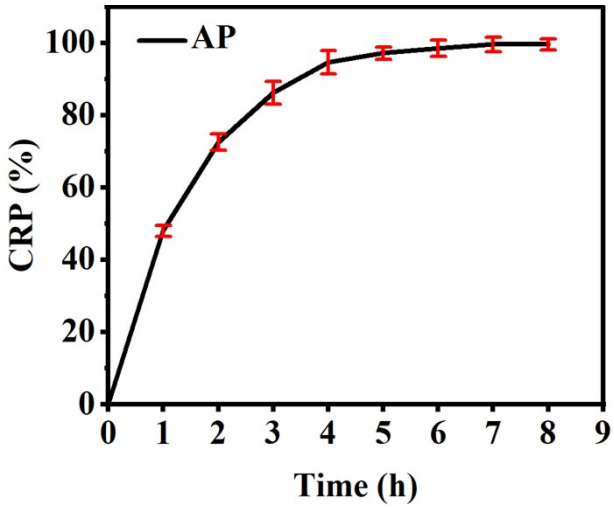

Figure S9. *In vitro* cumulative release percentage (CRP) of S/C-MNs patch

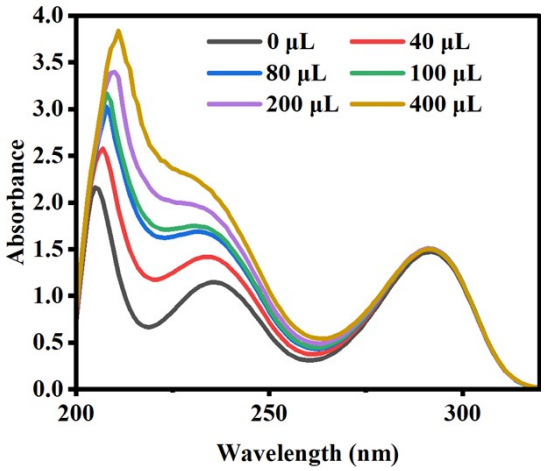

Figure S10. The UV-visible absorption spectra of UA with increased concentration of H_2O_2.