Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information

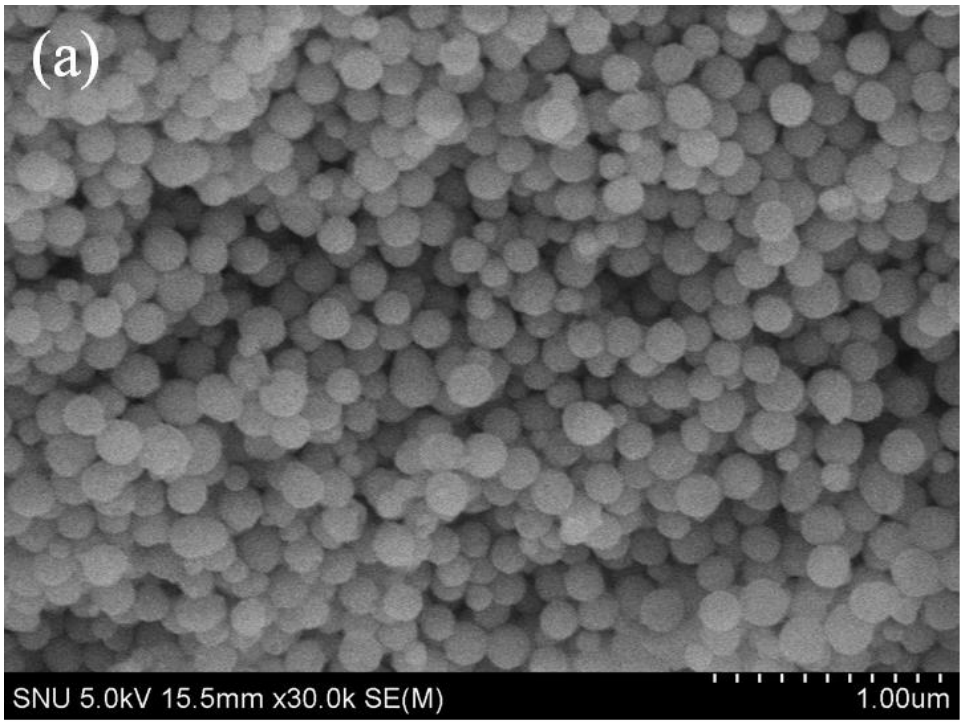
Intracellular Delivery of a Native Functional Protein Using Cell-Penetrating Peptide Functionalized Cubic MSN with Ultra-Large Mesopores

Sang-Eun Bae,[a] Soo Kyung Lyu,[b] Ki-Jung Kim,[a] Hee Joo Shin,[b]
Hyockman Kwon[*b] and Seong Huh[*a]

[a]*Department of Chemistry and Protein Research Center for Bio-Industry, Hankuk University of Foreign Studies, Yongin 17035, Korea, E-mail: shuh@hufs.ac.kr*

[b]*Department of Bioscience and Biotechnology and Protein Research Center for Bio-Industry, Hankuk University of Foreign Studies, Yongin 17035, Korea, E-mail:hmkwon@hufs.ac.kr*

Table of Contents



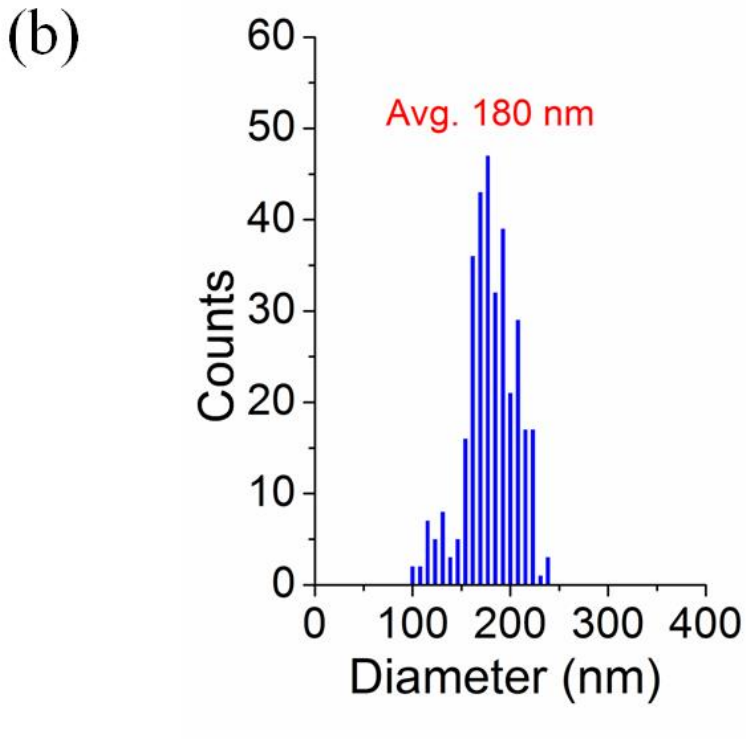


Figure S1. SEM image of calcined cMSN (a) and the corresponding particle size distribution histogram (b).

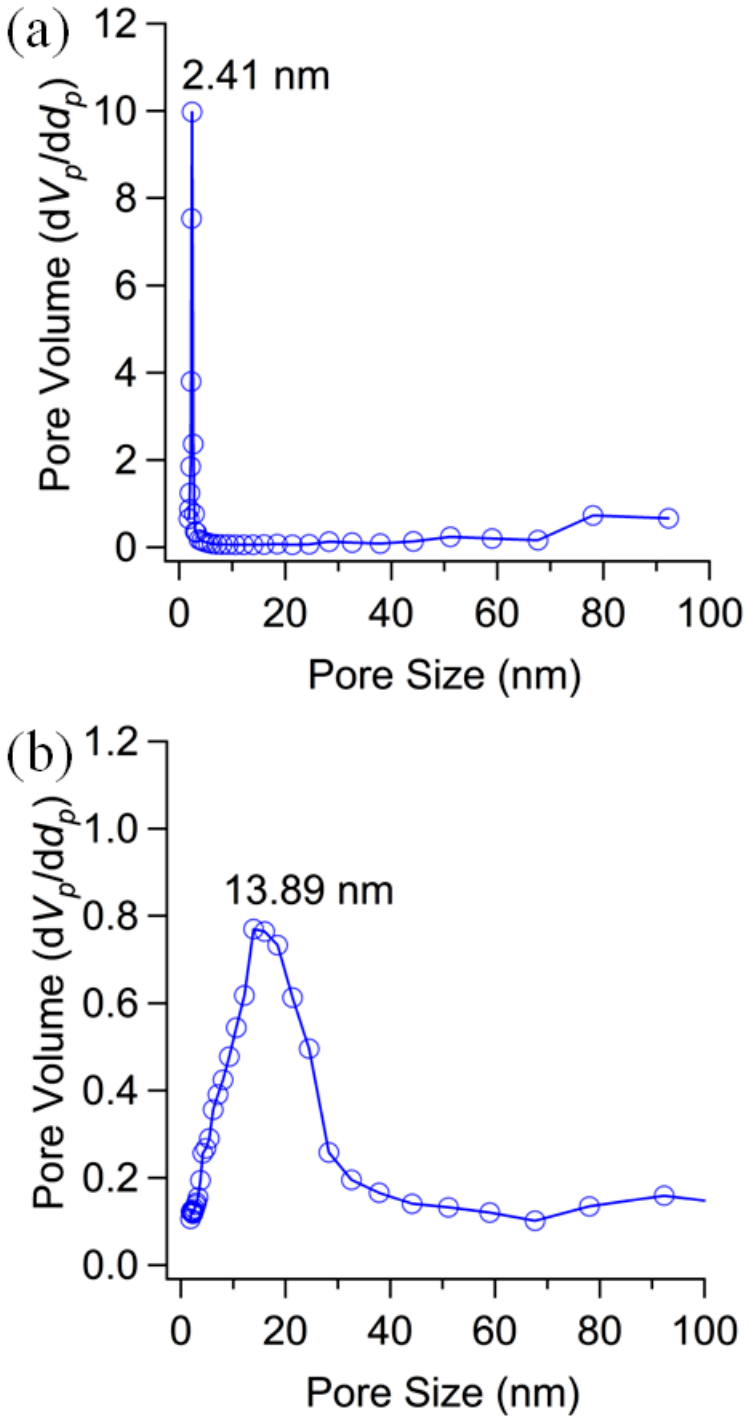


Figure S2. BJH pore size distribution curves for calcined cMSN (a) and Ca-cMSN (b).

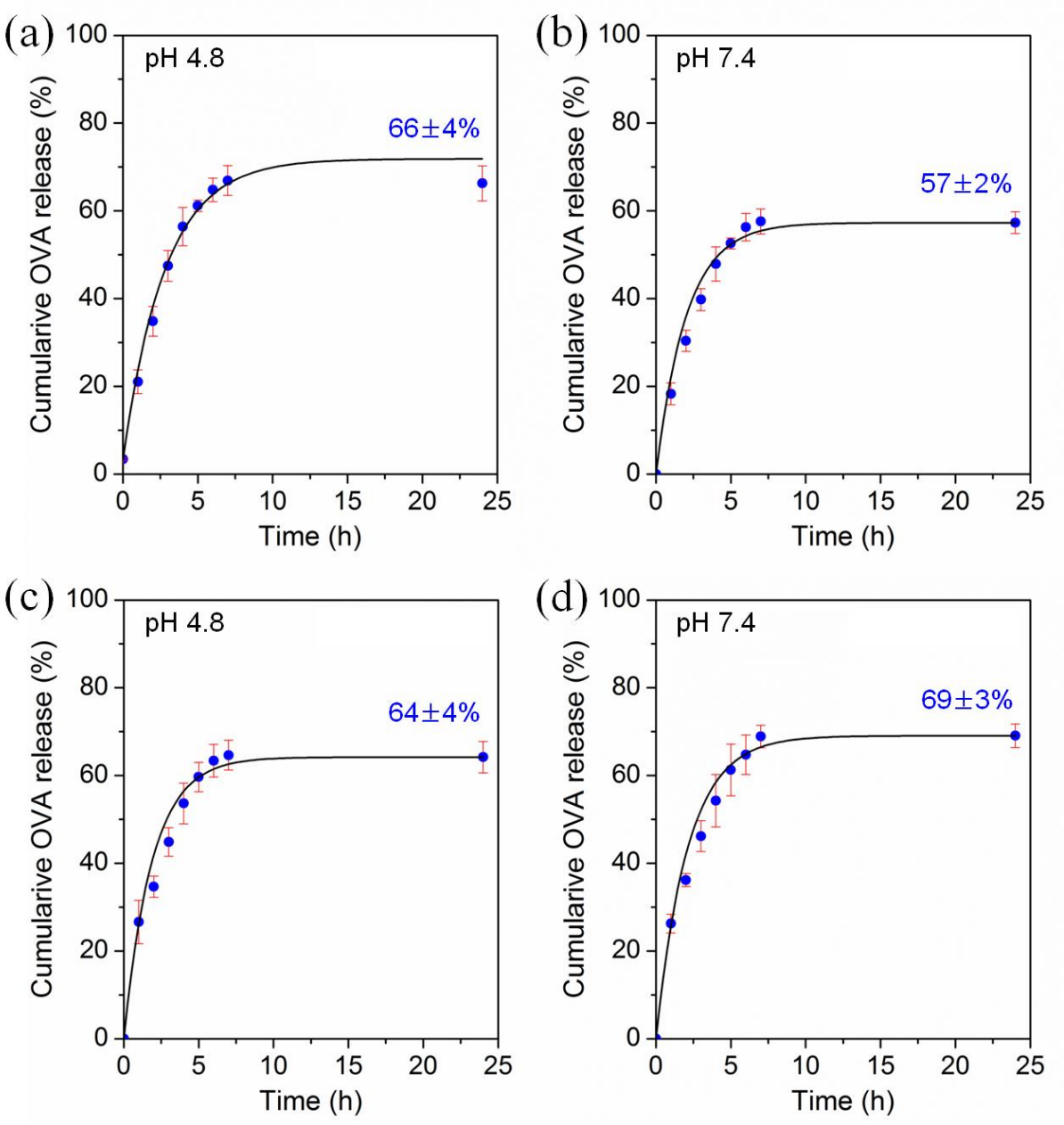


Figure S3. Cumulative release profiles of OVA from OVA-loaded Ca-cMSN (a, b) and OVA-loaded R8-Ca-cMSN (c, d). Each measurement was performed in triplicate.

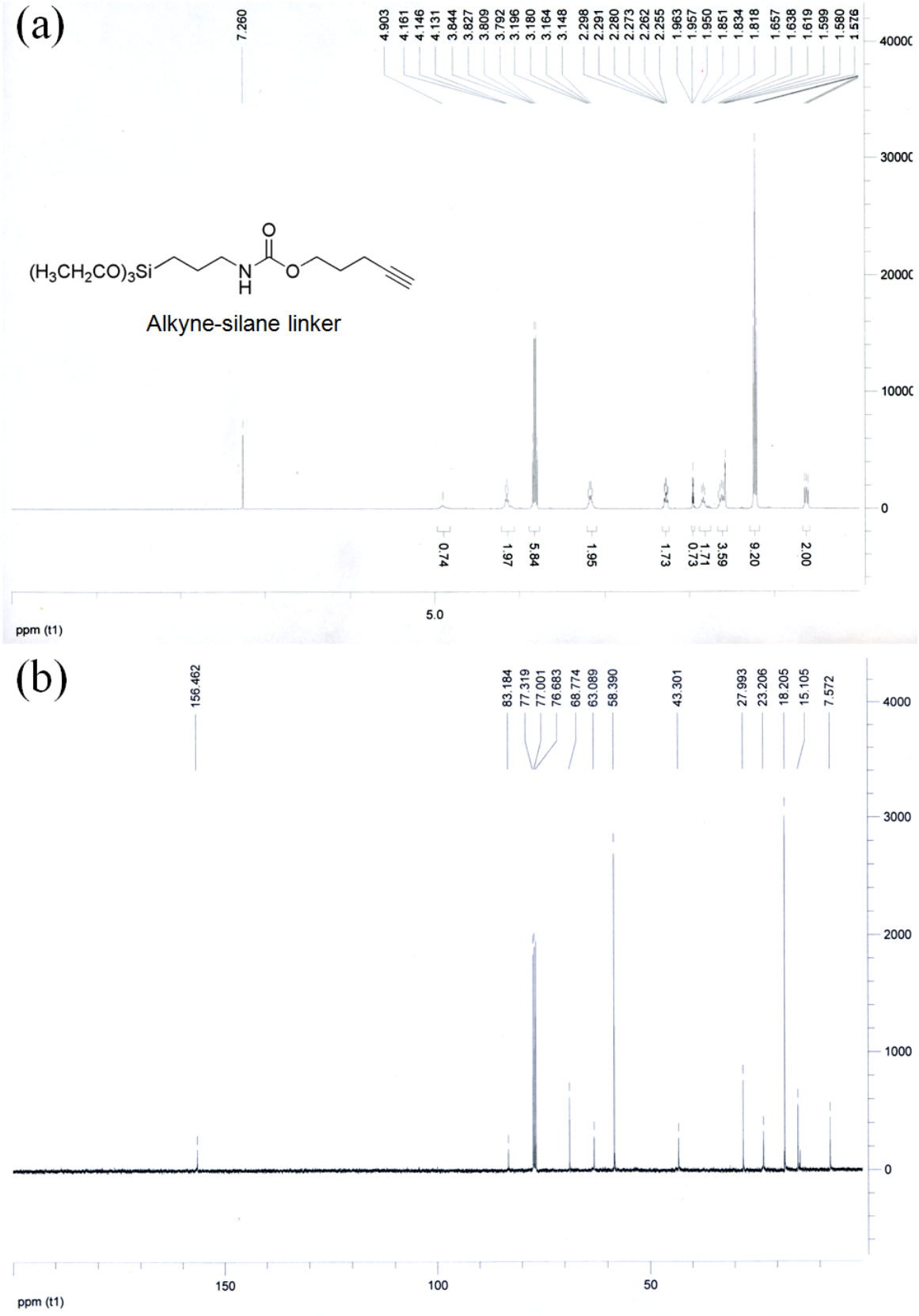


Figure S4. ^{1}H (a) and ^{13}C (b) NMR spectra of the alkyne-silane linker dissolved in $CDCl_3$.

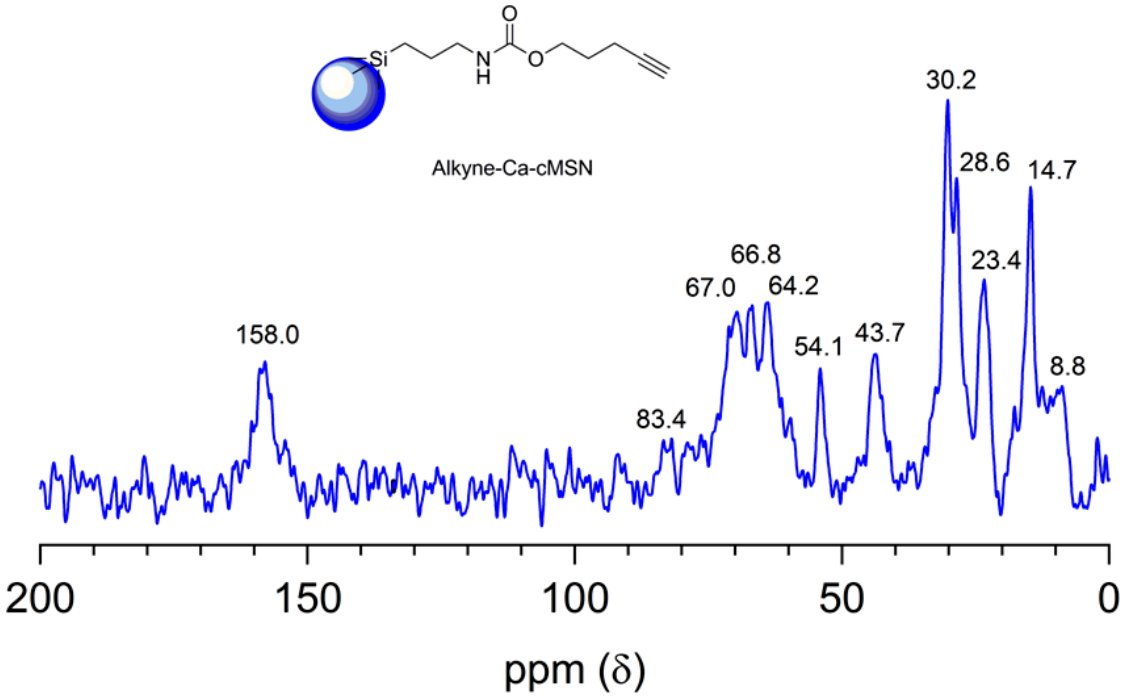


Figure S5. ^{13}C CP-MAS NMR spectrum of the alkyne-Ca-cMSN. Spinning rate = 7 kHz.

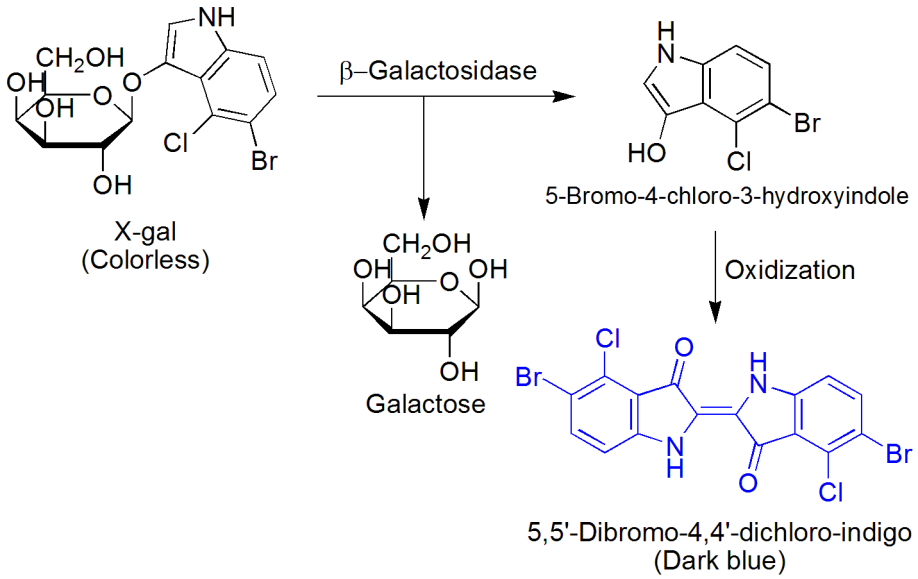


Figure S6. Illustration of the formation of 5,5'-dibromo-4,4'-dichloro-indigo from X-gal in the presence of β-galactosidase.

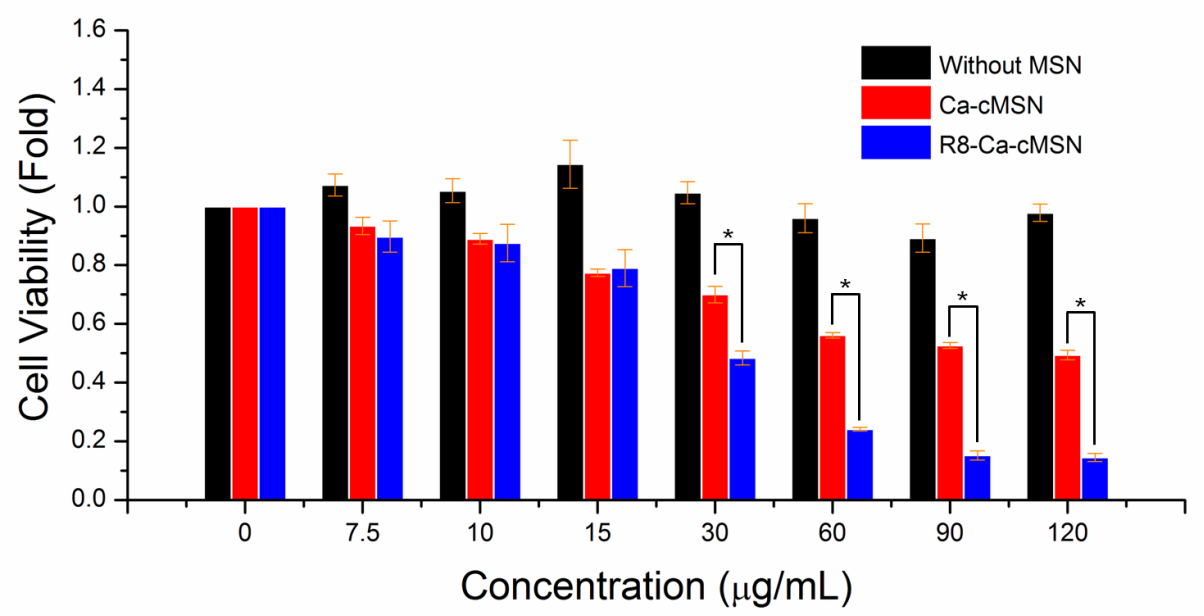


Figure S7. Viability of human TE671 (LoxP-LacZ) cells at various concentrations of Ca-cMSN and R8-Ca-cMSN. Human TE671 (LoxP-LacZ) cells were treated with the indicated concentrations of MSNs for 5 h. The cells were washed with the growth media and further incubated in the growth media for 19 h. Viability of human TE671 (LoxP-LacZ) cells was assessed by the MTT assay. The MTT values were normalized to the value of the control (without MSN). IC_{50} values of Ca-cMSN and R8-Ca-cMSN were 102 and 32 μg mL^{-1}, respectively, after 24 h incubation. Data are means ± standard deviations (n = 6). Asterisks (*) indicate statistically significant differences (*t*-test, $p < 0.001$).

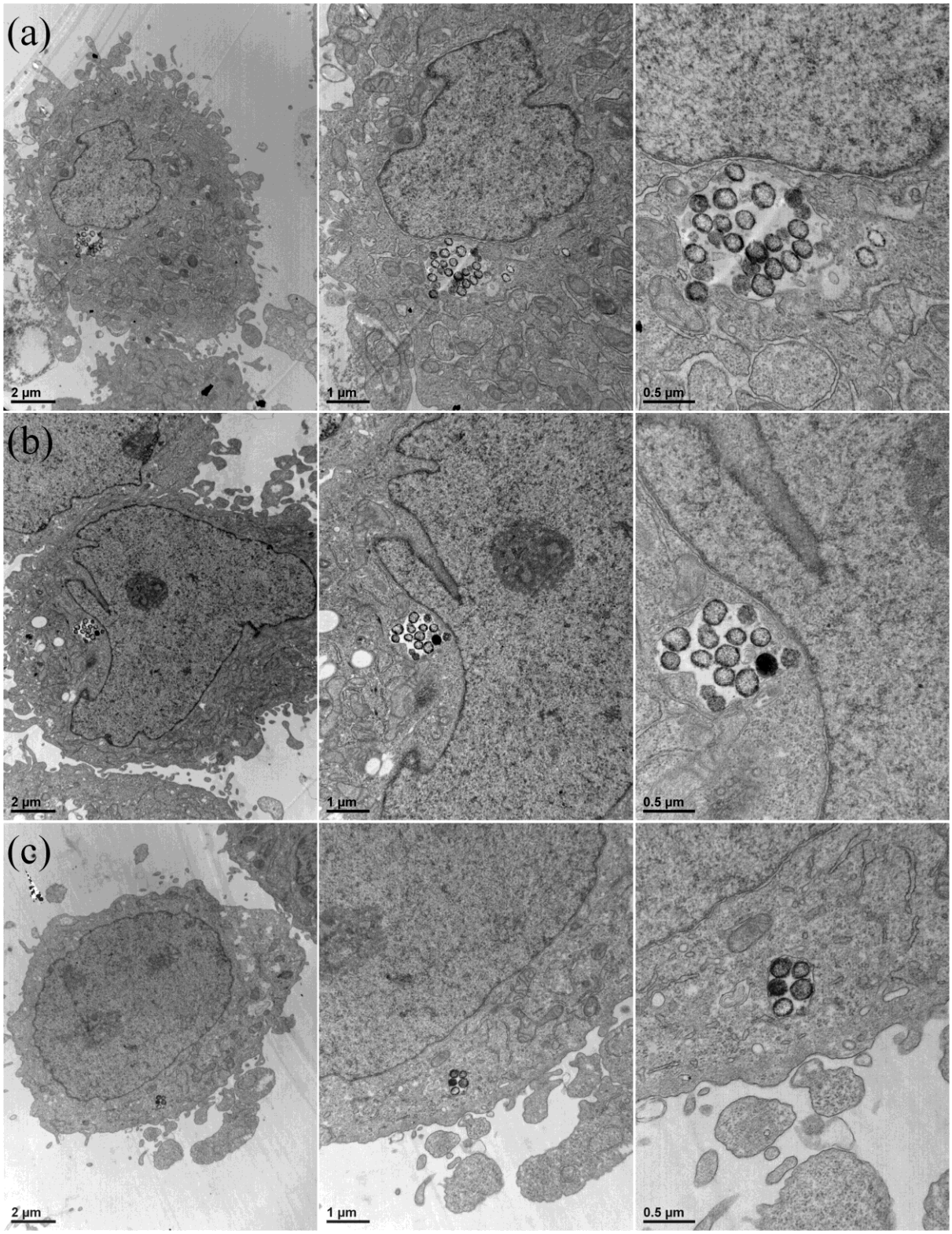


Figure S8. TEM images of the ultramicrotomed HeLa cells at varying magnifications. The HeLa cells after 1 d (a), 2 d (b), and 4 d (c) of incubation with Ca-cMSN.

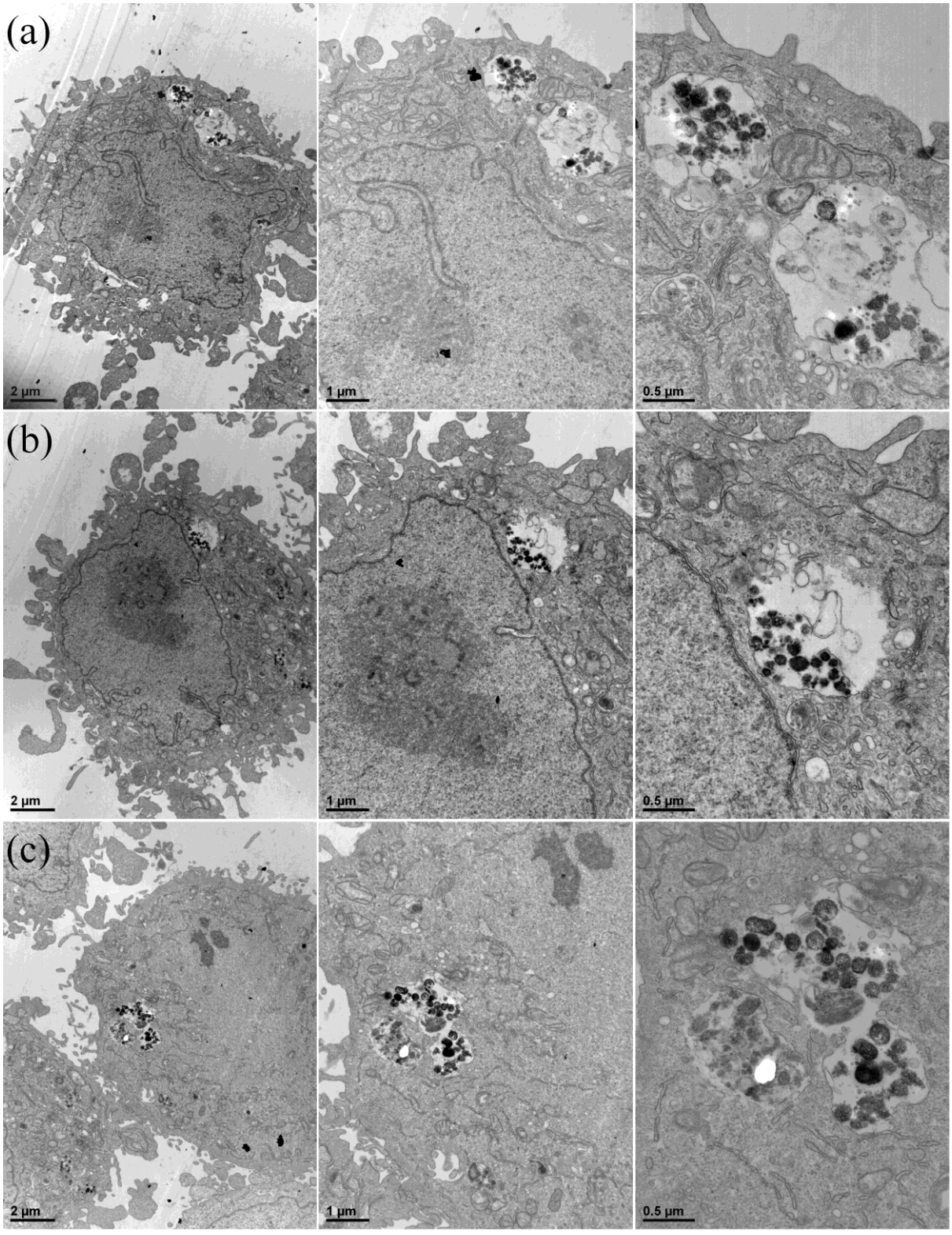


Figure S9. TEM images of the ultramicrotomed HeLa cells at varying magnifications. The HeLa cells after 1 d (a), 2 d (b), and 4 d (c) of incubation with R8-Ca-cMSN.