

**Electronic Supplementary Information (ESI)**

**Investigation of membrane condensation induced by CaCO<sub>3</sub> nanoparticles and its effect on membrane protein function**

Ke Luo,<sup>a†</sup> Ki-Baek Jeong,<sup>a†</sup> Jae-Min Oh,<sup>b</sup> Soo-Jin Choi,<sup>c</sup> Tae-Joon Jeon,<sup>d</sup> and Young-Rok Kim<sup>\*a</sup>

<sup>a</sup> *Graduate School of Biotechnology & Department of Food Science and Biotechnology, College of Life Sciences, Kyung Hee University, Yongin 17104, Korea.*

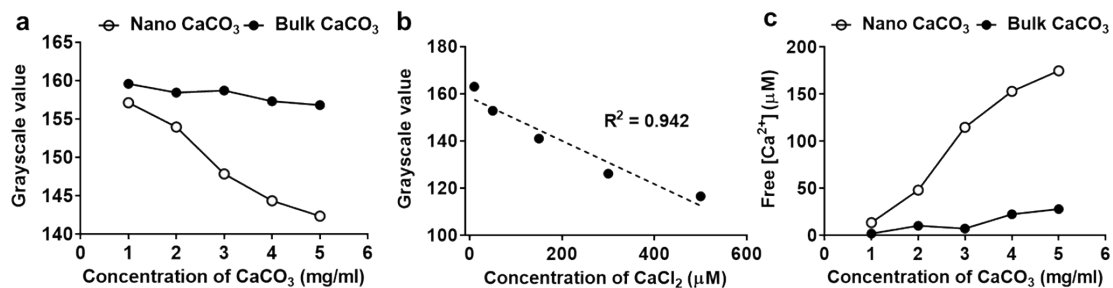
*Email: youngkim@khu.ac.kr*

<sup>b</sup> *Department of Chemistry and Medical Chemistry, College of Science and Technology, Yonsei University, Wonju 26493, Korea*

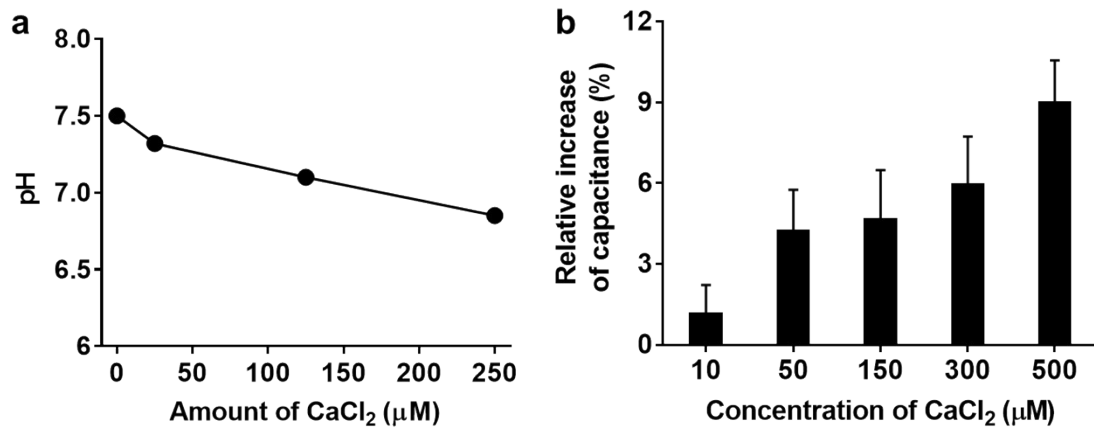
<sup>c</sup> *Department of Applied Food System, Major of Food Science and Technology, Seoul Women's University, Seoul 01797, Korea.*

<sup>d</sup> *Department of Biological Engineering, Inha University, Incheon 22212, Korea*

*† These authors contributed equally to this work.*



**Fig. S1** The concentration of  $\text{Ca}^{2+}$  ions dissociated from Bulk and Nano  $\text{CaCO}_3$ . a) Grayscale value curves reflecting the concentration of dissociated  $\text{Ca}^{2+}$  ions from Nano  $\text{CaCO}_3$  and Bulk  $\text{CaCO}_3$ . b) Reference curve for quantification of  $\text{Ca}^{2+}$  ions. Grayscale values were plotted over the corresponding concentrations of  $\text{Ca}^{2+}$  ions. c) Grayscale values were converted to the concentration of  $\text{Ca}^{2+}$  ions to show the concentration of dissociated  $\text{Ca}^{2+}$  ions from both Bulk and Nano  $\text{CaCO}_3$ .



**Fig. S2** Effect of CaCl<sub>2</sub> on membrane capacitance. a) Changes in pH value of the electrolyte solution as a function of the concentration of CaCl<sub>2</sub>. b) Relative increase of membrane capacitance in response to the varying concentration of CaCl<sub>2</sub>.