Multifunctional natural polysaccharides for high-performance rechargeable lithium-ion batteries

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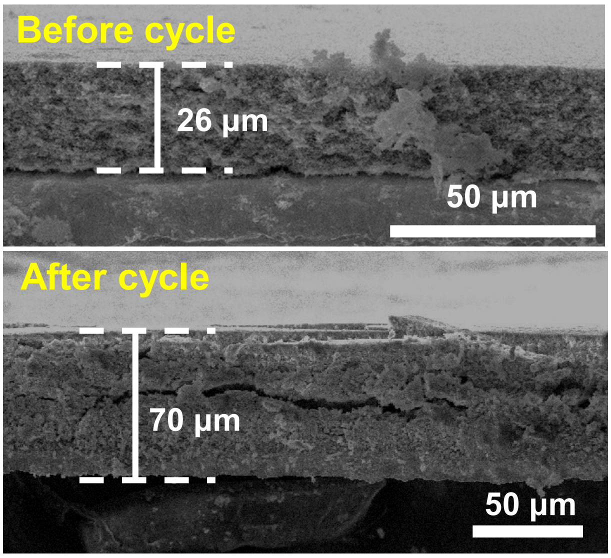


Fig. S1 Cross-sectional SEM images of Si electrodes containing PVdF binder before (top) and after 200 cycles (bottom).

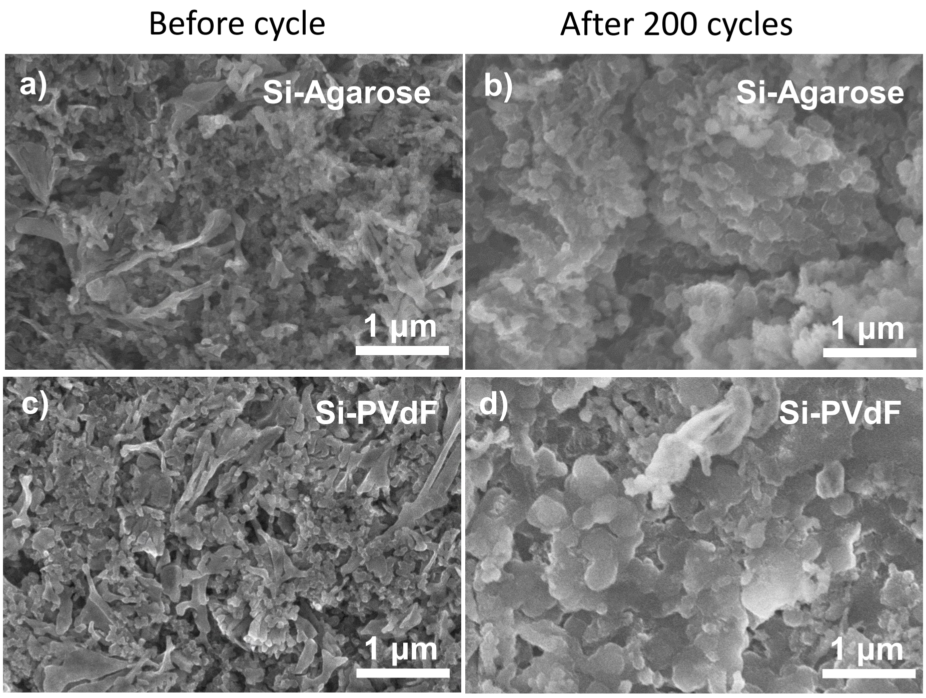


Fig. S2 SEM images showing surfaces of (a) agarose-assisted Si electrode (before cycle), (b) agarose-assisted Si electrode (after 200 cycles), (c) Si-PVdF electrode (before cycle), and (d) Si-PVdF electrodes (after 200 cycles).

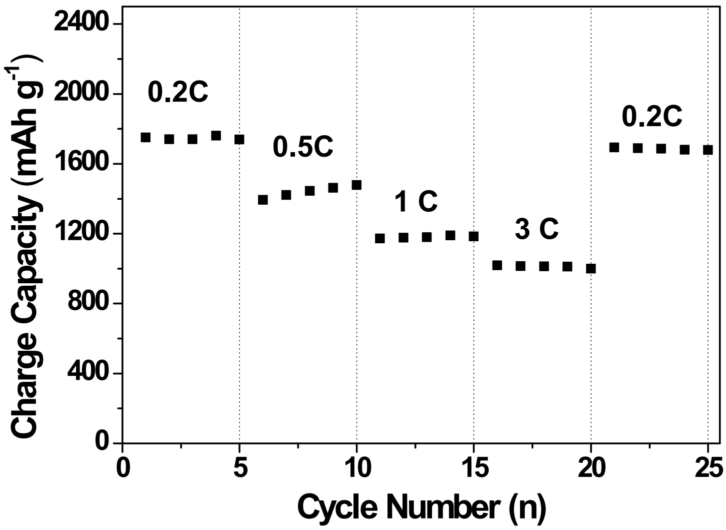


Fig. S3 Rate capabilities of agarose-assisted Si electrode obtained in the range of 0.2-3C rates.

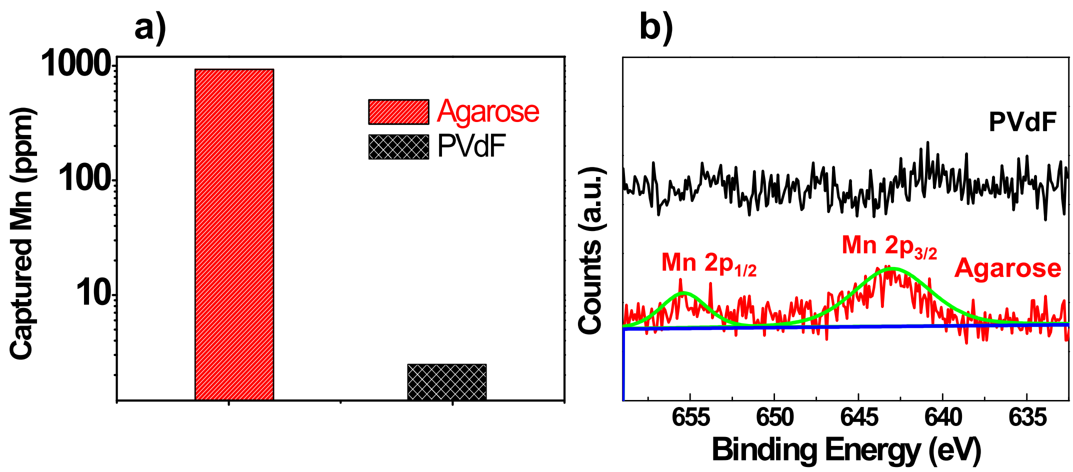
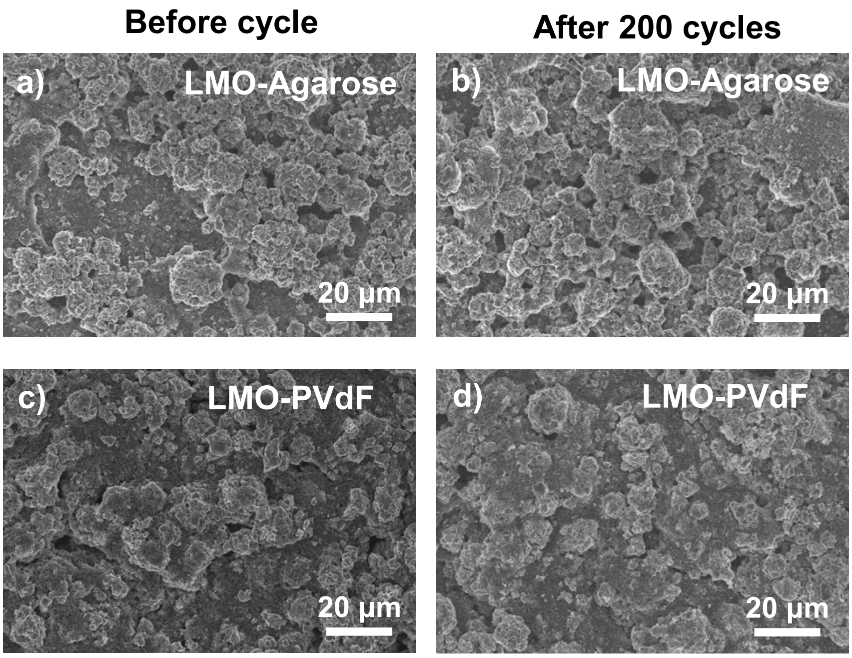


Fig. S4 (a) Mn^{2+} ion capture capacities of the agarose and PVdF films determined by inductively coupled plasma mass spectrometry (ICP-MS). (b) XPS spectra of Mn 2p for the agarose and PVdF films after immersion in a $Mn(ClO_4)_2$ solution. A 10 mM manganese perchlorate solution ($Mn(ClO_4)_2 \cdot xH_2O$) was prepared by introducing the proper amount of ($Mn(ClO_4)_2 \cdot xH_2O$) in the electrolyte containing 1 M of lithium perchlorate ($LiClO_4$) in ethylene carbonate-propylene carbonate (EC/PC, 1:1, v/v). Then, the agarose and PVdF films were immersed in 1 mL of the manganese perchlorate solution at 25 ^{o}C for 2 h. After washing with the EC/PC mixture, the films were dried in air, and then the captured amount of manganese ions were analyzed by ICP-MS.



ICP analyses

Element	Wt%	At%
O	22.6	44.3
F	**10.7**	**17.7**
Mn	66.7	38.0

Element	Wt%	At%
O	10.8	23.4
F	**17.0**	**31.1**
Mn	72.2	45.5

Fig. S5 SEM images of (a) LMO-agarose cathode (before cycle), (b) LMO-agarose (after 200 cycles), (c) LMO-PVdF (before cycle), and (d) LMO-PVdF (after 200 cycles). After 200 cycles, ICP analyses results of both the LMO-agarose and LMO-PVdF cathodes are shown in the right column.