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$_4$)$_2$·xH$_2$O) was prepared by introducing the proper amount of (Mn(ClO$_4$)$_2$·xH$_2$O) 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 °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.
**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.