Supporting Information

Electrochemical performances of highly amorphous GeO$_x$ powders synthesized in different alcohols for use in Na- and Li-ion batteries

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Table S1 Contribution ratio of Ge states in amorphous GeO$_x$ electrode from deconvolution of Ge 3d spectra.
Figure S1 Schematic of expected process of forming GeOx powders.
XRD patterns of the amorphous GeO\textsubscript{x} powders synthesized by oxidation using different alcohols.

The broad peaks at approximately 25° and 50° are assignable to amorphous GeO. In the case of the electrode of the powder synthesized using methanol, the sharp peaks at 2θ of 26° is assignable to GeO\textsubscript{2}.

**Figure S2** XRD patterns of the amorphous GeO\textsubscript{x} powders synthesized by oxidation using different alcohols.
The second charge/discharge curves of the amorphous GeO\textsubscript{x} electrodes

The second charge/discharge curves of the amorphous GeO\textsubscript{x} electrodes are shown in Figure s1. During the 2nd cycle of the Li-ion cell, the electrodes exhibited reversible capacities of 1239–1213 mAh g\textsuperscript{-1} and an efficiency of 90 %. On the other hand, the electrodes used in the Na-ion cell exhibited reversible capacities of 310–319 mAh g\textsuperscript{-1} and an efficiency of 93 %.

**Figure S3** The second charge/discharge curves of the amorphous GeO\textsubscript{x} electrodes. (a) 2\textsuperscript{nd} cycle in Li-ion cells and (b) 2\textsuperscript{nd} cycle in Na-ion cells.
Table S1 Contribution ratio of Ge states in amorphous GeO$_{x}$ electrode from deconvolution of Ge 3d spectra.

<table>
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<th>Ge (%)</th>
<th>Ge+2 (%)</th>
<th>Ge+4 (%)</th>
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<tr>
<td>2-propanol</td>
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<td>25</td>
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<tr>
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<tr>
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