High-performance Silicon inverse opal as an anode for lithium-ion batteries

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Silicon has received much attention by its highly reversible capacity with lithium ions (4200 mAh g−1). A crucial drawback of silicon, however, is to undergo huge volume change (> 300%), leading to mechanical stress of the electrode and pulverization of the particles during the alloying/dealloying with lithium ions. As a result, the rapid capacity fading occurs during cycling process. Many approaches have been studied to prevent the volume changes of silicon. Among them, macroporous nanostructured materials synthesized in the form of the inverse opal structure help to accommodate the significant volume change during cycling without cracking the electrode.
In this work, inverse opal structured-silicon will be fabricated by magnesium reduction. Silicon having inverse opal structure will be observed through X-ray diffractometer (XRD), scanning electron microscopy (SEM) and transmission electron microscopy (TEM). To evaluate an electrochemical characterization of the inverse opal structured-silicon, we will conduct coin-half cell tests including several electrochemical tests such as cyclic voltammetry (CV), electrochemical impedance spectroscopy.