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"Electrochemical characteristics of carbon-silicon composite electrodes for the anode of lithium secondary battery"

Abstract:
Graphite has been commonly employed as an anode material for lithium ion batteries because of its low and flat working voltage and better cycle performance compared with the metal oxides. During charge process, a lithium ion reacts with the six atoms of carbon. Thus, theoretical maximum storage capacity of graphite can be calculated as 372 mAh/g.

In order to increase the specific capacity of the lithium secondary batteries, silicon is considered as one of the promising alternative anode materials. According to the electrochemical reactions between silicon and lithium, silicon can alloy with lithium up to 4.4 Lithium per silicon at high temperature. Theoretical capacity of silicon, therefore, is about 4,000 mAh/g. However, silicon is difficult to applied due to the problems as follows: the first one is poor cyclability caused by severe volume expansion and the second one is the high irreversible capacity at first cycle.

Here, the purpose of this study is accomplishment of high capacity of anode material with good cycle performance through silicon coating on the graphite surface. In the present study, preparation of highly dispersed silicon on the graphite anode is tried. In the carbon-silicon composite system, we expect that silicon acts lithium alloying reactants during charge-discharge process and also carbon matrix play a role as the lithium intercalation sites and conducting medium between silicon particles as well.

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