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Li-ion Secondary Battery Patent Analysis: Si-based High Capacity Anode Materials

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Abstracts

Si-based high capacity anode materials drawing intense interest as next-generation anode materials

As of 2011, graphite is accounting for more than 97% of anode materials for li-ion secondary batteries in the world regardless of natural or artificial graphite. Recently, the percentage of natural graphite, which is available at relative low prices, is increasing.

The remaining 3% is occupied by high performance anode materials: these materials give priority consideration to performance such as charging characteristics, even though they are more expensive than graphite anode materials. The high performance anode material market has recently grown by about 1%, even though it is insignificant. In addition, these materials are expected to substitute existing graphite anode materials, developing a great market.

These high performance anode materials include soft carbon, and hard carbon, which are based on carbon like Si-based anode materials, Sn-based anode materials, LTO-based anode materials and graphite, but do not have the multi-layer crystal structure of graphite.

Among them, lithium or Si metal has theoretical capacity of more than 3000mAh/g, which is 10 time higher than 370mAh/g of graphite. However, it is impossible to use these metal anode active materials themselves, since they cause volume expansion of hundreds %. Thus, there are aggressive efforts to study methods of alloying, combining with carbon, or nanoizing those materials to suppress anode disintegration caused by volume expansion.

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This report specialized in Si-based materials of which the use is expected to increase as high capacity anode materials provides analysis of patents that had been filed from January 1, 1990 to May 31, 2012. Total 1,144 patents filed in Europe, Korea, and Japan as well as the United States have been analyzed. Si-based anode materials are classified into monomaterials using only Si, composites, and Si thin-film, which are subdivided again. The feature that sets this report apart from other reports on patents is in-depth analysis.

The in-depth analysis embraces patent trend analysis including the percentage of patent applications, patent trends for the recent 10 years, and technology focus by assignee, technology development trends through analysis of major patents by technology, information about assignees who filed multiple patents by country, and analysis of patent disputes between major companies which are selected based on patenting activities and market shares.

This report is expected to be a good guideline for research institutes and companies which are planning to develop Si-based anode materials or enter the market.

Key points of this report

Focuses on Si-based anode material technologies which are expected to grow rapidly;

Provides insight through in-depth analysis as well as general patent trends

Analyzes patents filed from January 1, 1990 to May 31, 2012;

Analyzes all patents filed in the United States, Japan, Korea, and Europe;

Provides case study of patent infringement between anode material sellers and patent holding groups.

Provides a list of effective patents (sold separately)

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