

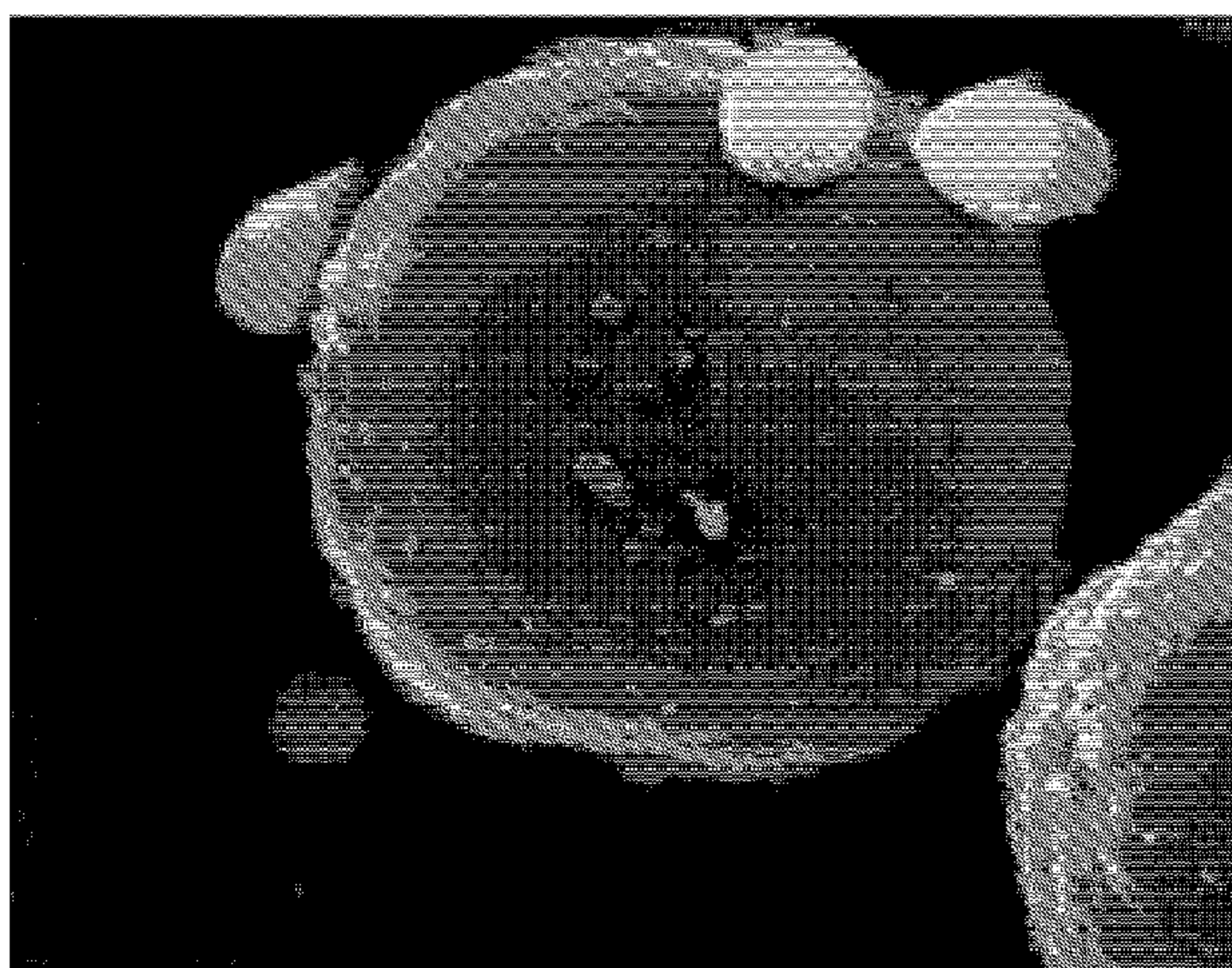


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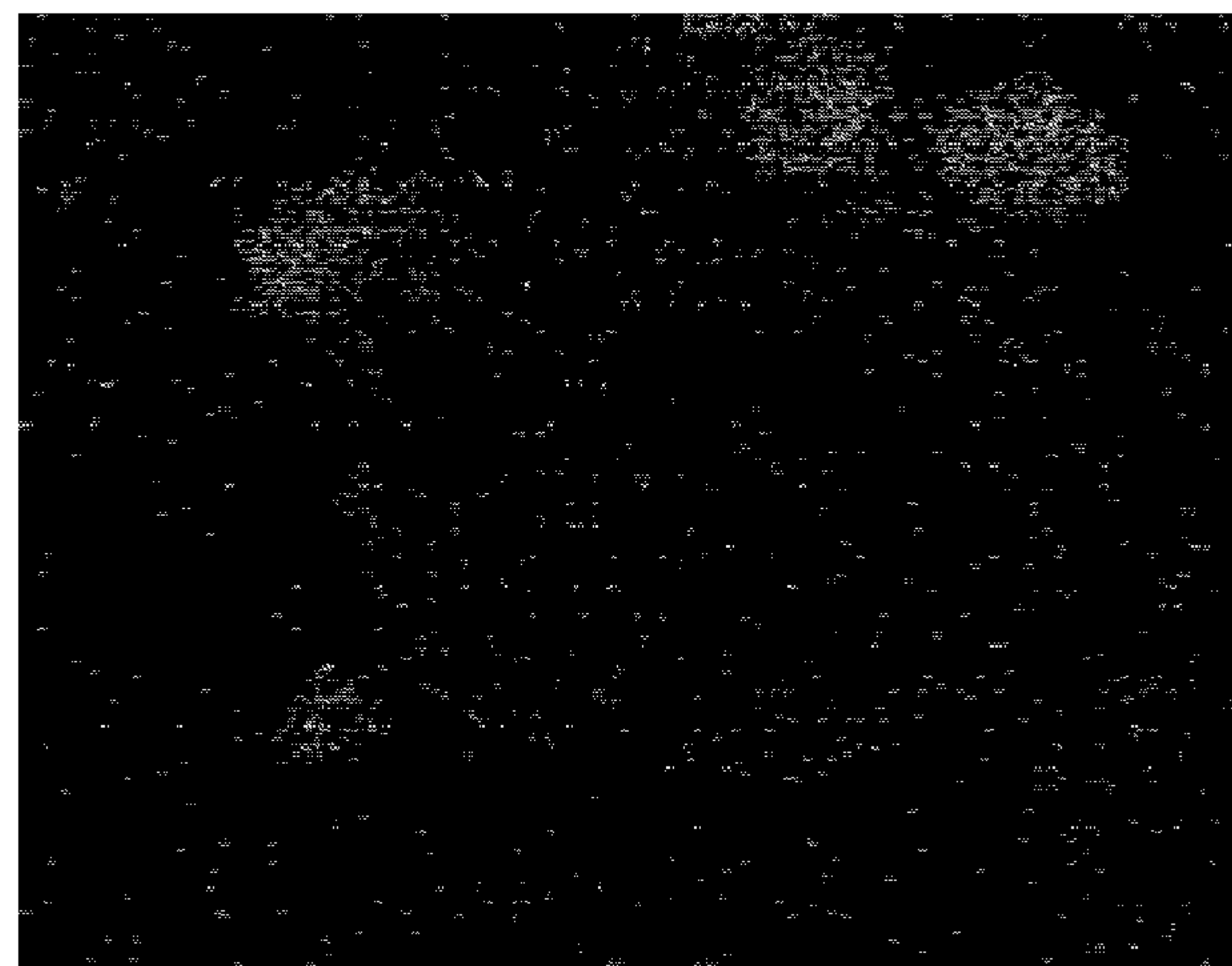
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(54) Titre : MATIERE ACTIVE D'ANODE DE TYPE COEUR-ECORCE DESTINEE A UNE BATTERIE SECONDAIRE AU LITHIUM, PROCEDE DE PREPARATION CORRESPONDANT ET BATTERIE SECONDAIRE AU LITHIUM LA CONTENANT

(54) Title: CORE-SHELL TYPE ANODE ACTIVE MATERIAL FOR LITHIUM SECONDARY BATTERY, METHOD FOR PREPARING THE SAME AND LITHIUM SECONDARY BATTERY COMPRISING THE SAME



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Description

CORE-SHELL TYPE ANODE ACTIVE MATERIAL FOR LITHIUM SECONDARY BATTERY, METHOD FOR PREPARING THE SAME AND LITHIUM SECONDARY BATTERY COMPRISING THE SAME

Technical Field

- [1] The present invention relates to a core-shell anode active material for a lithium secondary battery, a method for preparing the same, and a lithium secondary battery comprising the same. In particular, the present invention relates to an anode active material, which can improve electrical characteristics and safety of a lithium ion secondary battery or lithium ion polymer battery, and a method for preparing the same.

Background Art

- [2] With rapid development of electronics, communications and computer industries, portable electronic communication equipments such as camcorders, mobile phones or notebook computers develop remarkably. Accordingly, the demand for a lithium secondary battery as a power source for driving the portable electronic communication equipments is increasing day by day. In particular, in application of electric vehicles, uninterruptible power supplies, motor tools or artificial satellites, research and development of the lithium secondary battery as an environmentally friendly power source is lively made inside and outside of the country including Japan, Europe and U.S.A.
- [3] Currently, an anode active material for a lithium secondary battery includes a crystalline carbon such as a natural graphite or an artificial graphite, and an amorphous carbon such as a non-graphitizable carbon or a graphitizable carbon.
- [4] The natural graphite has advantages of low price, a flat discharge curve at a negative potential and excellent initial discharge capacity. However, charge/discharge efficiency and charge/discharge capacity reduce remarkably while charge and discharge cycles are repeated.
- [5] A mesophase graphite has a spherical particle shape and allows a high density filling, and thus is capable of improving an energy density per volume of a battery and exhibits excellence in forming an electrode plate. However, the mesophase graphite has a disadvantage of a low reversible capacity.
- [6] The non-graphitizable carbon has advantages of excellent safety and a large capacity.

Technical Problem

- [15] An object of the present invention is to provide an anode active material for a lithium secondary battery, which can improve safety without deteriorating basic battery characteristics of the lithium secondary battery, and a method for preparing the anode active material with excellent reproducibility and productivity.

Technical Solution

- [16] In order to achieve the above-mentioned object, an anode active material for a lithium secondary battery according to the present invention comprises a carbon based material core portion, and a shell portion formed outside of the carbon based material core portion by coating the carbon based material core portion with a spinel-type lithium titanium oxide. The anode active material for a lithium secondary battery according to the present invention comprises the metal oxide shell portion to improve conductivity and high output density, thereby resulting in excellent electrical characteristics. And, a lithium secondary battery using the above-mentioned anode active material for a lithium secondary battery according to the present invention can ensure safety sufficiently.
- [17] And, a method for preparing an anode active material for a lithium secondary battery according to the present invention comprises (S1) preparing a carbon based material for forming a core portion; and (S2) coating the core portion with a spinel-type lithium titanium oxide to form a shell portion outside of the core portion.
- [18] The method for preparing an anode active material may further comprise heating the resultant product of the step (S2).
- [19] The above-mentioned anode active material for a lithium secondary battery may be used to manufacture an anode of a lithium secondary battery and a lithium secondary battery comprising the anode.

Brief Description of the Drawings

- [20] FIG. 1 is a graph illustrating particle size distribution before coating (a) and after coating (b) of an anode active material prepared in Example 1.
- [21] FIG. 2 shows SEM (Scanning Electron Microscope) photographs of the anode active material (a) prepared in Example 1 and an anode active material (b) prepared in Comparative example 1.
- [22] FIG. 3 shows SEM photographs of cross-sectional mapping of particles of the core-shell anode active material prepared in Example 1.
- [23] FIG. 4 is a graph illustrating discharge characteristics according to current density of

an anode collector; and

an anode active material layer including an anode active material, a binder and a conductive material, and formed on at least one surface of a anode collector, wherein the anode active material is defined in any one of claims 1 to 4.

[10]

A lithium secondary battery comprising:

a cathode;

an anode; and

a separator interposed between the cathode and the anode,

wherein the anode is defined in claim 9.

