Appeal Decision

Appeal No.2015-471

Hiroshima, Japan
Appellant TODA KOGYO CORPORATION

Tokyo, Japan
Patent Attorney OKADA, Kazuhiko

The case of appeal against the examiner's decision of refusal concerning Japanese Patent Application No.2009-275867 entitled "Powder Of Lithium Complex Compound Particle, Method For Producing The Same, And Nonaqueous Electrolyte Secondary Cell" (Japanese Unexamined Patent Application Publication No.2010-155775 published on July 15, 2010) has resulted in the following appeal decision.

Conclusion

The appeal of the case was groundless.

Reason

1 History of the procedures

The present application was filed on December 3, 2009 (claiming priority date of December 4, 2008), for which the decision of refusal was issued on September 30, 2014, and an appeal against the examiner's decision of refusal was filed on January 8, 2015 together with a written amendment of the claims. The written amendment on January 8, 2015 was dismissed by a decision of dismissal of amendment dated November 24, 2015, and in response to the notice of reasons for refusal dated the same date, a written argument and a written amendment were submitted on February 1, 2016.

2 The Invention

The inventions according to Claims 1 to 9 of the present application are specified in accordance with the matters described in Claims 1 to 9 of the scope of claims that have been amended by the written amendment dated February 1, 2016. The invention according to Claim 1 (hereinafter referred to as "the Invention") is set forth below:

"[Claim 1]

Lithium composite compound particles comprising a lithium composite compound represented by the following compositional formula 1, which lithium composite compound particles have an ionic strength ratio A (LiO^-/NiO_2^-) of not more than 0.3 and an ionic strength ratio B ($Li_3CO_3^+/Ni^+$) of not more than 20 as measured on a surface of the respective lithium composite compound particles using a time-of-flight secondary ion mass spectrometer, wherein the lithium composite compound particles have a carbon content of not more than 300 ppm:

Compositional formula 1

$Li_{1+x}Ni_{1-y-z}Co_yM_zO_2$

M=at least one of B and Al, $-0.02 \leq x \leq 0.02$,

$0 < y \leq 0.20$, $0 < z \leq 0.10$"

3 Reasons for refusal described in the notification of reasons for refusal issued by the body

The reasons for refusal notified by the body include the following general reasons:

Those skilled in the art could have easily conceived of the inventions according to Claims 1 and 10 in the scope of claims originally attached to the application on the basis of the invention described in the following publication that had been published in Japan before the priority date. Thus, the appellant should not be granted a patent for the inventions in accordance with the provisions of Article 29(2) of the Patent Act.

Publication: Jisuk Kim et al., Washing Effect of a $LiNi_{0.83}Co_{0.15}Al_{0.02}O_2$ Cathode in Water, Electrochem. and Solid-State Lett., November 21, 2005, Vol. 9, No. 1, p. A19-A23 (hereinafter referred to as "Cited Document".)

The Invention corresponds to an invention according to original Claim 4 of the scope of claims that was originally attached to the application. The Claim 4 was rewritten into an independent form.

4 Judgment by the body

Taking into consideration the examination on the content of the written argument and the written amendment submitted by the appellant, the body has made a judgment that the appellant should not be granted a patent for the Invention in accordance with the provisions of Article 29(2) of the Patent Act because of the following reason in accordance with the above-mentioned reasons for refusal.

(1) Invention described in Cited Publication

A Described matters in Cited Document

(A) "The formation of LiOH and Li_2CO_3 impurities on high Ni content $LiNi_{0.83}Co_{0.15}Al_{0.02}O_2$ powders due to H_2O and CO_2 absorption from the air can be reduced without structural degradation by washing in water" (page A19, Abstract section)

(B) "The electrochemical properties were tested in a coin-type 2016R cell with lithium metal as an anode, ..." (page A19, right column, lines 22 to 23)

(C) "Table I shows the moisture and carbon content of the $LiNi_{0.83}Co_{0.15}Al_{0.02}O_2$ powders .... When the CO_2 air reacts with H_2O, H_2CO_3 is formed, which decreases the pH to about 5.5. Acidic CO_3^{2-} ions then attack the particle surface, and Li^+ ions can be easily leached from the bulk, forming LiOH and Li_2CO_3. Hence, the amounts of LiOH and Li_2CO_3 are expected to increase with increasing air exposure time." (page A19, right column, Results and Discussion section, lines 1 to 12)

(D) "When the air-exposed $LiNi_{0.83}Co_{0.15}Al_{0.02}O_2$ powders was heat-treated at 700°C for 2h, the moisture content in the powder stored in a dry keeper was 250 ppm, but its value rapidly increased to 2576 ppm after being exposed to air again." (page A20, left column, lines 6 to 9)

(E) "However, the moisture contents of the annealed sample after the first wash and subsequent heat-treatment after being stored in a dry holder and in air were 150 and 870 ppm, respectively, in indicating that some portion of the Li_2CO_3 and LiOH had been washed away by water." (page A20, left column, lines 14 to 18)

(F) "Using reflection Fourier transform infrared (FTIR), the evolution of the Li_2CO_3 or

LiOH vibration peaks was investigated with increasing washing frequency. After washing, the Li_2CO_3 and LiOH peaks disappeared, suggesting that both Li_2CO_3 and LiOH had been rinsed away by the water." (page A22, left column, line 6 from the bottom to right column, line 2)
(G) "The initial capacities and cycling life of the bare and washed samples (after heat-treatment at 700°C) were compared in order to determine the effect of washing on the electrochemical properties, ..." (page A22, right column, lines 5 to 7)

B Cited Invention

According to the described matter (A), the Cited Document discloses that LiOH and Li_2O_3, which are impurities formed on $LiNi_{0.83}Co_{0.15}Al_{0.02}O_2$ powders, may be reduced without structural degradation by washing in water. Specifically, according to item (C), LiOH and Li_2CO_3 are formed on a surface of $LiNi_{0.83}Co_{0.15}Al_{0.02}O_2$ powders by the reaction with moisture and CO_2 in air, and according to items (D) and (E), Li_2CO_3 and LiOH are somewhat removed by one-time water washing and heat treatment for 2 hours at 700°C. The same thing is described in item (F).

Accordingly, when these matters are summarized in terms of the product of $LiNi_{0.83}Co_{0.15}Al_{0.02}O_2$ powders, the following invention (hereinafter referred to as "Cited Invention") is dislosed in the Cited Document:
"$LiNi_{0.83}Co_{0.15}Al_{0.02}O_2$ powders in which Li_2CO_3 and LiOH, which are impurities formed thereon, are removed by water washing and subsequent heat treatment for 2 hours at 700°C"

(2) Comparison / Judgment
A Comparison

Since it is obvious that "$LiNi_{0.83}Co_{0.15}Al_{0.02}O_2$ powders" of Cited Invention has a composition falling within "Compositional formula $Li_{1+x}Ni_{1-y-z}Co_yM_zO_2$ where M=at least one of B and Al, $-0.02\leq x\leq 0.02$, $0<y\leq 0.20$ and $0<z\leq 0.10$", it corresponds to "Lithium composite compound particles represented by the compositional formula 1" of the Invention.

Consequently, it is common to the Invention and Cited Invention that "Lithium composite compound particles are represented by
Compositional formula 1 $Li_{1+x}Ni_{1-y-z}Co_yM_zO_2$ where M=at least one of B and Al, $-0.02\leq x\leq 0.02$, $0<y\leq 0.20$ and $0<z\leq 0.10$", and they are different from each other in the following point (hereinafter referred to as "Difference".).

The lithium composite compound particles of the Invention, which lithium composite compound particles "have an ionic strength ratio A (LiO^-/NiO_2^-) of not more than 0.3 and an ionic strength ratio B ($Li_3CO_3^+/Ni^+$) of not more than 20 as measured on a surface of the respective lithium composite compound particles using a time-of-flight secondary ion mass spectrometer", whereas Cited Invention is silent about the ionic strength ratios A, B and the carbon content on the surface of the lithium composite compound particles.

B Judgment

Hereinafter, whether or not those skilled in the art could have easily conceived of the above Difference is examined.

The particles of the Invention are subjected to the heat treatment for about 2

hours at a temperature of 500 to 850°C after water washing (paragraph [0042] of the specification of the present application, Examples 1 to 6). Thus, in the lithium composite compound particles of Cited Invention, Li_2CO_3 and LiOH on the surface have been removed by water washing and subsequent heat treatment for 2 hours at 700°C as is similar to the particles of the Invention. Further, the purpose for water washing and heat treatment of Cited Invention is to improve properties of cation active material of secondary battery according to the described matters (B)(G), which is the same as that of the Invention.

Consequently, Cited Invention includes the one obtained by the treatments similar to the Invention with an intention similar to that of the Invention. It is acknowledged that the degree of removal of Li_2CO_3 and LiOH in Cited Invention would be similar to that of the Invention.

Besides, the degree of removal of Li_2CO_3 and LiOH from the particle surface in the Invention is specified by means of time-of-flight secondary ion mass spectrometer (hereinafter, referred to as "TOF-SIMS") with numerical ranges of an ionic strength ratio A (LiO^-/NiO_2^-) for LiOH and an ionic strength ratio B ($Li_3CO_3^+/Ni^+$) for Li_2CO_3 as well as carbon content. Such specific numerical ranges are neither described nor suggested in Cited Document as is argued by the appellant.

However, TOF-SIMS is a well-known device for analyzing element composition or chemical structure on a sample surface. Therefore, those skilled in the art would use TOF-SIMS as a necessary device for analyzing the surface status of particles in Cited Invention.

Therefore, those skilled in the art would have easily conceived of removing Li_2CO_3 and LiOH that had been recognized as lithium compound-based impurities on the surface of lithium composite compound particles to an appropriate level with an intention to improve charge-discharge cycle property of lithium secondary battery in Cited Invention. It does not seem particularly difficult to adjust the removal level to numerical ranges as specified in the Invention by means of well-known TOF-SIMS. Further, it cannot be said that the effects are significant.

Further, it does not seem particularly difficult to adjust the carbon content to 300 ppm or less. Further, it cannot be said that the effects are significant. Because it is obvious that the carbon content on a surface of lithium composite compound particle may be lowered when Li_2CO_3 on the surface is removed to a proper level.

Accordingly, the Invention was easily conceivable by those skilled in the art on the basis of the inventions described in the Publication, and thus the appellant should not be granted a patent for it.

5 Conclusion

As described above, those skilled in the art could have easily conceived of the inventions according to Claim 1 of the present application on the basis of the Publication, and thus the appellant should not be granted a patent for the inventions under the provisions of Article 29(2) of the Patent Act.

Accordingly, the present application should be rejected.

Therefore, the appeal decision shall be made as described in the conclusion.

March 28, 2016

Chief administrative judge: NIIDA, Tomoo
Administrative judge: MAMADA, Tadahiro
Administrative judge: NAGATA, Fumiyasu