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Datasheet for the decision of 5 March 2025

Case Number: T 0849/23 - 3.3.05

Application Number: 18206564.9

Publication Number: 3486220

IPC: C01G53/00, H01M4/36, H01M4/525

Language of the proceedings: EN

Title of invention:
CATHODE ACTIVE MATERIAL FOR LITHIUM SECONDARY BATTERY AND LITHIUM SECONDARY BATTERY INCLUDING THE SAME

Patent Proprietor:
ECOPRO BM CO., LTD.

Opponent:
Margaret Dixon Limited

Headword:
cathode active material/ECOPRO

Relevant legal provisions:
EPC Art. 100(c), 100(a), 123(2), 54, 56
RPBA 2020 Art. 13(2)

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It can be changed at any time and without notice

Keyword:
Grounds for opposition - subject-matter extends beyond content of earlier application (no)
Novelty - main request (no) - auxiliary request 2 (no)
Amendments - added subject-matter - auxiliary requests 1, 3-10 (yes)
Inventive step - auxiliary requests 11, 12 (no)
Amendment after summons - exceptional circumstances (no)

Decisions cited:
T 0201/83

Catchword:

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Case Number: T 0849/23 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 5 March 2025

Appellant: (Patent Proprietor)	ECOPRO BM CO., LTD. 100, 2 Sandan-ro Ochang-eup Cheongwon-gu Cheongju-si, Chungcheongbuk-do 28117 (KR)
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Respondent: (Opponent)	Margaret Dixon Limited 40 Basinghall Street London EC2V 5DE (GB)
Representative:	Mewburn Ellis LLP Aurora Building Counterslip Bristol BS1 6BX (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 10 March 2023 concerning maintenance of the European Patent No. 3486220 in amended form.**

Composition of the Board:

Chairman	E. Bendl
Members:	S. Besselmann
	R. Winkelhofer

Summary of Facts and Submissions

I. The appeal, by the patent proprietor (appellant), lies from the opposition division's interlocutory decision according to which European patent EP 3 486 220 B1 in amended form on the basis of then auxiliary request 16 met the requirements of the EPC.

II. The patent in suit concerns a cathode active material for a lithium secondary battery and a lithium secondary battery including same.

III. With the statement of grounds of appeal, the appellant defended the patent as granted and filed 39 auxiliary requests, of which auxiliary request 37 was the request allowed by the opposition division. After receipt of the communication pursuant to Article 15(1) RPBA, the appellant replaced all the auxiliary requests on file by new auxiliary requests 1-14, several of which are identical (except for their numbering) to auxiliary requests filed with the statement of grounds of appeal. New auxiliary request 14 is the request allowed by the opposition division.

IV. Claim 1 of the patent as granted (**main request**) reads as follows:

"*A cathode active material composition including particle 1 represented by Chemical Formula 1 below and particle 2 represented by Chemical Formula 2 below:*

[Chemical Formula 1] $Li_{a1}Ni_{x1}Co_{y1}Mn_{z1}M_{1-x1-y1-z1}O_2$

[Chemical Formula 2] $Li_{a2}Ni_{x2}Co_{y2}Mn_{z2}M_{1-x2-y2-z2}O_2$

wherein 0.6≤x1≤0.99, 0.59≤x2≤0.98, 0.5≤a1≤1.5, 0.5≤a2≤1.5, 0.0≤y1≤0.3, 0.0≤y2≤0.3, 0.0≤z1≤0.3, 0.0≤z2≤0.3, 0.0≤1-x1-y1-z1≤0.3, and 0.0≤1-x2-y2-z2≤0.3, and
M is one or more elements selected from the group consisting of B, Ba, Ce, Cr, F, Mg, Al, Cr, V, Ti, Fe, Zr, Zn, Si, Y, Nb, Ga, Sn, Mo, W, P, Sr, and combinations thereof, and wherein:
the particle 1 represented by Chemical Formula 1 has a size greater than the particle 2 represented by Chemical Formula 2; and
x1 and x2 satisfy the condition of 0.01≤x1-x2≤0.4."

Thus, claim 1 consists of the following features (feature numbers assigned by the opposition division (point II.2.1) are also adopted here):

F 1.1 $0.6 \leq x1 \leq 0.99$
F 1.2 $0.59 \leq x2 \leq 0.98$
F 1.3 $0.5 \leq a1 \leq 1.5$
F 1.4 $0.5 \leq a2 \leq 1.5$
F 1.5 $0 \leq y1 \leq 0.3$
F 1.6 $0 \leq y2 \leq 0.3$
F 1.7 $0 \leq z1 \leq 0.3$
F 1.8 $0 \leq z2 \leq 0.3$
F 1.9 *M is one or more elements selected from the group consisting of B, Ba, Ce, Cr, F, Mg, Al, V, Ti, Fe, Zr, Zn, Si, Y, Nb, Ga, Sn, Mo, W, P, Sr, and combinations thereof*
F 1.10 $0.0 \leq 1-x1-y1-z1 \leq 0.3$
F 1.11 $0.0 \leq 1-x2-y2-z2 \leq 0.3$
F 1.12 *the particle 1 represented by Chemical Formula 1 has a size greater than the*

particle 2 represented by Chemical Formula 2;

F 1.13 *x1 and x2 satisfy the condition of 0.01≤x1-x2≤0.4*

V. Claim 1 of **auxiliary request 1** differs from claim 1 of the main request in that the ranges for several components are different, as follows (markings by the board to show the amendments):

"*wherein ~~0.6~~≤x1≤0.99,~~ 0.59~~0.80≤x2≤0.98, 0.5≤a1≤1.5, 0.5≤a2≤1.5, 0.0≤y1~~≤0.3,~~ 0.0≤y2~~≤0.3~~, 0.0≤z1~~≤0.3~~, 0.0≤z2~~≤0.3~~, 0.0≤1-x1-y1-z1~~≤0.3~~, and 0.0≤1-x2-y2-z2~~≤0.3~~*"

and in that the last part of the claim has been amended, as follows:

"*the particle 1 represented by Chemical Formula 1 ~~has a size greater than~~ and the particle 2 represented by Chemical Formula 2 have different sizes;*

the particle 1 represented by Chemical Formula 1 has a size of 6 μm to 30 μm and the particle 2 represented by Chemical Formula 2 has a size of 1 μm to 6 μm; and

x1 and x2 satisfy the condition of 0.01≤x1-x2≤~~0.40~~0.10".

Claim 1 of **auxiliary request 2** differs from claim 1 of the main request in that the last part of the claim has been amended as follows:

"*the particle 1 represented by Chemical Formula 1 has a size greater than the particle 2 represented by Chemical Formula 2;*

the particle 1 represented by Chemical Formula 1 has a size of 6 μm to 30 μm and the particle 2 represented by Chemical Formula 2 has a size of 1 μm to 6 μm; ~~and~~

x1 and x2 satisfy the condition of 0.01≤x1-x2≤0.4; and

the particle 2 is mixed in the ratio of 5 to 40 wt%

with respect to a total weight of the cathode active material composition".

Claim 1 of **auxiliary request 3** differs from claim 1 of auxiliary request 2 in that "*particle 2 is mixed in the ratio of 5 to ~~40~~ 20 wt% with respect to a total weight of the cathode active material composition*".

Claim 1 of **auxiliary request 4** differs from claim 1 of auxiliary request 2 in that the ranges for several components are different, as follows:
"*wherein ~~0.6~~0.81≤x1≤0.99, ~~0.59~~0.80≤x2≤0.98, 0.5≤a1≤1.5, 0.5≤a2≤1.5, 0.0≤y1≤~~0.3,~~ 0.0≤y2≤~~0.3~~, 0.0≤z1≤~~0.3~~, 0.0≤z2≤~~0.3~~, 0.0≤1-x1-y1-z1≤~~0.3~~, and 0.0≤1-x2-y2-z2≤~~0.3~~*"
and (in the last part of the claim)
"*x1 and x2 satisfy the condition of 0.01≤x1-x2≤0.10~~0.4~~*"

Claim 1 of **auxiliary request 5** differs from claim 1 of auxiliary request 4 in that "*particle 2 is mixed in the ratio of ~~5~~ 20 to 40 wt% with respect to a total weight of the cathode active material composition*".

Claim 1 of **auxiliary request 6** differs from claim 1 of the main request in that the ranges for several components are different, as follows (markings by the board to show the amendments):
"wherein ~~0.6~~≤x1≤0.99, ~~0.59~~0.85≤x2≤0.98, 0.5≤a1≤1.5, 0.5≤a2≤1.5, 0.0≤y1≤~~0.3,~~ 0.0≤y2≤~~0.3~~, 0.0≤z1≤~~0.3~~, 0.0≤z2≤~~0.3~~, 0.0≤1-x1-y1-z1≤~~0.3~~, and 0.0≤1-x2-y2-z2≤~~0.3~~"
and in that the last part of the claim has been amended, as follows:
"the particle 1 represented by Chemical Formula 1 has a size greater than the particle 2 represented by Chemical Formula 2;
the particle 1 represented by Chemical Formula 1 has a size of 6 μm to 30 μm and the particle 2 represented by

Chemical Formula 2 has a size of 1 μm to 6 μm; ~~*and*~~
x1 and x2 satisfy the condition of 0.01≤x1-x2≤0.4; and

the particle 2 is mixed in the ratio of 5 to 20 wt% with respect to a total weight of the cathode active material composition".

Claim 1 of **auxiliary request 7** differs from claim 1 of auxiliary request 2 in that x1 and x2 satisfy the condition of "*0.05≤x1-x2≤0.10*".

Claim 1 of **auxiliary request 8** differs from claim 1 of auxiliary request 4 in that no lower limit is specified for x1 (*x1≤0.99*), and in that x1 and x2 satisfy the condition of "*0.05≤x1-x2≤0.10*".

Claim 1 of **auxiliary request 9** differs from claim 1 of auxiliary request 8 in that the particle 2 is mixed "*in the ratio of 5 to 20 wt% with respect to a total weight of the cathode active material composition*".

Claim 1 of **auxiliary request 10** differs from claim 1 of auxiliary request 8 in that the particle 2 is mixed "*in the ratio of 20 to 40 wt% with respect to a total weight of the cathode active material composition*".

Claim 1 of **auxiliary request 11** differs from claim 1 of the main request in that x1 and x2 satisfy the condition of "*x1-x2=0.05*",
and in that the following feature is added to the end of the claim:
"*the particle 2 is mixed in the ratio of 5 to 40 wt% with respect to a total weight of the cathode active material composition*".

Claim 1 of **auxiliary request 12** differs from claim 1 of auxiliary request 11 in that *"the particle 2 is mixed in the ratio of ~~5~~ 20 to 40 wt% with respect to a total weight of the cathode active material composition*".

Claim 1 of **auxiliary request 13** differs from claim 1 of auxiliary request 11 in that *"the particle 2 is mixed in the ratio of 5 to ~~40~~ 20 wt% with respect to a total weight of the cathode active material composition*".

Auxiliary request 14 is the request allowed by the opposition division.

VI. The following document is of relevance here.
D2 WO 2010/094394 A1

VII. The appellant's arguments relevant to the present decision can be summarised as follows.

Main request
The feature in claim 1 as granted according to which the particle 1 represented by Chemical Formula 1 has a size greater than the particle 2 represented by Chemical Formula 2 did not constitute an unallowable intermediate generalisation. The requirements of Article 123(2) EPC were met.

The composition according to claim 1 as granted was novel because it related to a bimodal particle size distribution, which could not be compared to the trimodal particle size distribution disclosed in D2. Furthermore, D2 did not anticipate the chemical composition specified in claim 1, in particular the nickel contents. D2 merely described the properties of the precursor mixture which could not be directly compared with the final composition.

Auxiliary request 1
The requirements of Article 123(2) EPC were met. The values of x2 and x1-x2 in claim 1 were directly and unambiguously derivable from the examples and paragraphs [0025] and [0026] of the application as filed. These parts of the application as filed, including Comparative Example 2, clearly related to the claimed invention, which was not limited merely to the best embodiment. The claimed ranges could be limited on the basis of a value disclosed in an example. The criterion established in T 201/83 for extracting a feature from an embodiment was met.

Similar considerations applied to auxiliary requests 4, 5 and 8-10.

Auxiliary request 2
Novelty was present because D2 did not anticipate the claimed range of the fine particle mixing ratio. D2 indicated a mixing ratio but this related to the precursor, not the final composition. Moreover, it was not specified whether the ratio was by weight or by volume. The corresponding figure in D2 (Figure 1) showed that the fine particle mixing ratio in the known composition was higher than claimed, when considering the final product.

Auxiliary request 3
The requirements of Article 123(2) EPC were met. The fine particle mixing ratio could be independently varied and controlled, as had been demonstrated in the inventive examples. The criterion established in T 201/83 for extracting a feature from an embodiment was again met.

Similar considerations applied to auxiliary request 6.

Auxiliary request 7
The requirements of Article 123(2) EPC were met. As outlined for auxiliary request 1, the skilled person would have derived from the application as filed that Comparative Example 2, illustrating x1-x2=0.10, formed part of the invention and was thus a suitable basis for amending the claim.

Auxiliary requests 11 and 12
The claimed composition in these requests was novel and involved an inventive step over D2. The technical problem was that of providing an improved composition. The skilled person, starting from D2, had no motivation to vary the x1-x2 value to solve the problem posed.

Auxiliary request 13
This request was closely related to requests previously on file and assisted with procedural economy. It should be taken into consideration. The requirements of Article 123(2) EPC were met following similar considerations as set out for auxiliary request 3 as regards the fine particle mixing ratio of 5 to 20 weight%.

VIII. The respondent did not reply in substance to the appeal and did not formulate any request. They were not represented at the oral proceedings, as they had indicated in writing (21 June 2024).

IX. The appellant requested that the decision under appeal be set aside and amended such that the opposition be rejected (main request), or that the patent be maintained on the basis of one of auxiliary requests 1 to 14 as filed on 5 February 2025.

Reasons for the Decision

Main request (patent as granted)

1. Article 100(c) EPC

1.1 According to the impugned decision, the feature in claim 1 according to which "*the particle 1 represented by Chemical Formula 1 has a size greater than the particle 2 represented by Chemical Formula 2*" extended beyond the content of the application as filed because it constituted an inadmissible intermediate generalisation of the disclosure in paragraphs [0025] and [0063] of that application. These paragraphs additionally required at least a specific relative nickel content, i.e. that fine particles (2) had an Ni content 5% less than the coarse particles (1).

1.2 Claim 1 of the application as filed does not specify any feature concerning particle size in either absolute or relative terms. It is, however, clear that the disclosed invention in general concerns a mixture of particles which are different in Ni composition *and size* [emphasis added] (paragraphs [0001] and [0012]), i.e. in which coarse particles and fine particles are present (see paragraphs [0009]-[0011], [0021] and [0045]). The definition of the invention in claim 1 of the application as filed and in paragraphs [0014]-[0019] has to be seen in this context, i.e. the general disclosure of there being coarse and fine particles is at least applicable to it, if it is not even an essential feature.

The indicated paragraphs do not specify which of the

particles (i.e. the particle 1 according to Chemical Formula 1 or the particle 2 according to Chemical Formula 2) is the "fine" and the "coarse" particle, respectively. Nevertheless, the teaching of the application as a whole consistently exemplifies compositions in which the coarse particle has the higher Ni content, i.e. in which the coarse particle is according to Chemical Formula 1 with x1>x2. While the examples and the specific teaching concern a certain difference in nickel content (paragraphs [0025] and [0063]), the general disclosure of the invention is not limited accordingly, as indicated. The examples and the specific teaching nevertheless serve as a pointer for identifying the particles of Chemical Formula 1 as the "coarse" particles. On this basis, it is directly and unambiguously derivable from the application as filed that "*the particle 1 represented by Chemical Formula 1 has a size greater than the particle 2 represented by Chemical Formula 2*".

1.3 Thus, the ground for opposition pursuant to Article 100(c) EPC does not prejudice maintenance of the patent.

2. Article 100(a) in conjunction with Article 54 EPC

2.1 Example 1 of Document D2 discloses a composition having features F1.1 to F1.12, see the impugned decision, point II.14.1 in conjunction with the feature table provided under point II.2.3 (reproduced here under point IV. above). In particular, the known cathode material composition is prepared from a precursor including fine particles having a particle size D50 of 3.9 µm and a nickel content (mol%) of 77.5% (i.e. x2=0.775), medium particles (having a particle size D50

of 6.3 µm), and coarse particles having a particle size D50 of 9.4 µm and a nickel content (mol%) of 82% (i.e. x1=0.82). The resulting difference in nickel content x1-x2 is thus calculated to be 0.045, as also found in the impugned decision (ibid.), thus also fulfilling feature F1.13.

The appellant took the view that the composition known from D2 was not comparable with the claimed subject-matter because D2 disclosed a trimodal particle size distribution, whereas the claim related to a bimodal particle size distribution. They also took the view that the indication of the nickel contents in D2, relating to the precursor mixture, could not be directly translated to the final composition.

However, claim 1 generally refers to a cathode active material composition *including* particle 1 represented by Chemical Formula 1 and particle 2 represented by Chemical Formula 2, wherein the particle 1 represented by Chemical Formula 1 has a size greater than the particle 2 represented by Chemical Formula 2. This open definition ("including") cannot be seen as a clear limitation of the claim to a bimodal particle size distribution. Instead, the presence of additional particles, having e.g. a different chemical formula and/or a different size, is not excluded, such as the medium-size particle fraction disclosed in D2.

Moreover, the teaching of the patent in suit itself relies on the same assumption that the properties of the hydroxide precursor mixture equate to those in the final cathode active material composition. This is not only supported by a comparison of the product claim with the method claim, but it can also be derived from the part "Comparative Examples 1 to 4 and Inventive

Examples 1 to 6: Preparation of Mixed Cathode Active Material Composition" and Table 3 of the patent in suit, which shows the mixing ratio in the precursor. Moreover, D2 itself confirms the validity of such an approach, see Table 1a in D2 which reports similar nickel contents (and particle sizes measured by SEM) in the final product.

2.2 The subject-matter of claim 1 is therefore not novel in view of D2.

Auxiliary request 1

3. Article 123(2) EPC

3.1 The amendments in claim 1 are, *inter alia*, that the lower limit of x2 has been defined to be 0.80, and the range x1-x2 has been defined as 0.10.

According to the appellant, these amendments were based on Comparative Example 2 and Preparation Example 3.

However, Preparation Example 3 relates to a single particle type (as opposed to a composition with particles 1 and 2 as specified in the claim), which is then used in the composition of Comparative Example 2 only. This Preparation Example is directly linked to Comparative Example 2 and cannot, on its own, constitute a basis for the amendment.

3.2 The appellant held that Comparative Example 2, despite being labelled *comparative*, provided a basis for further refining and limiting the definition of the claimed invention.

3.2.1 In particular, the appellant was of the view that the labelling in this case was not critical in that there were invention examples which did not fall within the scope of claim 1 as filed (i.e. inventive examples 4-6) and a comparative example, namely Comparative Example 2 as relevant here, which was within the scope of claim 1 as filed. This could easily be derived from Table 3, which was not complicated. The appellant further submitted that, while Comparative Example 2 illustrated deviations from optimal conditions, it exhibited very good charge capacity and first efficiency values (Table 4). The invention was not limited to the optimum. The skilled person would readily identify Comparative Example 2 as an embodiment of the invention, which could consequently be used to define the invention more narrowly.

3.2.2 These arguments are not convincing. There is indeed an inconsistency in that Comparative Example 2 - despite its express labelling as *comparative* - does fall within the scope of original claim 1. However, this does not necessarily lead to the conclusion that it is in fact meant to illustrate the invention; it may just as well lead to the conclusion that essential features are missing from the definition of the invention in claim 1 as filed. In this case, the corresponding description in fact confirms the comparative nature of Comparative Example 2. The latter relates to a composition of coarse particles having a nickel content of 90% (x1=0.90) and fine particles having a nickel content of 80% (x2=0.80), and thus x1-x2=0.10, and a fine particle mixing ratio of 20 wt% (Tables 1 and 3).

The description consistently teaches benefits of the inventive examples relating to a difference in nickel content of 5% (x1-x2=0.05), see paragraphs [0025],

[0026], [0040], [0063] and [0080] of the application as filed, as opposed to the difference in nickel content of 10% (shown in Comparative Example 2), see paragraph [0025]. As can be derived from said parts of the description, a difference in nickel content of 5% (x1-x2=0.05) provides fine and coarse particles having similar "optimal capacity manifestation" (or expression) temperatures ("optimal temperatures" in the following), i.e. the respective heat treatment temperatures at which optimal capacity is obtained are similar for the fine and coarse particles, as is desired (paragraphs [0031], [0040] and [0063]). It can readily be seen by comparing Tables 2 and 3 that the respective optimal temperatures of the fine and coarse particles are indeed similar - and in fact identical - in the inventive examples, which all relate to x1-x2=0.05. In contrast, they are different in the comparative examples. According to the testing of the mixed compositions, optimal capacity was expressed when the Ni content of the fine particles was 5% less than that of the coarse particles (i.e. x1-x2=0.05), and the ratio of the fine particles was 20 to 40%, but when the Ni composition of the fine particles was equal to (i.e. x1-x2=0) or 10 mol% less than (i.e. x1-x2=0.10) that of the coarse particles, optimal capacity was not obtained despite the ratio of fine particles being 20% (see paragraph [0025]). This is apparent in Tables 4 and 6.

3.2.3 The appellant was also of the view that Comparative Example 2 exhibited similar or even better performance in terms of charge capacity and first efficiency than some of the inventive examples, and better first efficiency than Comparative Example 1.

3.2.4 However, Comparative Example 2 shows a lower charge capacity and first efficiency than Inventive Example 2

against which it should be compared, in view of its overall active material composition and fine particle mixing ratio. Comparative Example 2 cannot be compared with Inventive Examples 4-6 (relating to x1-x2=0.05, but which are not within the scope of the claim in view of their excessively low x2 value), in view of the much lower overall nickel content of the latter. There is also no clear improvement in Comparative Example 2 compared with Comparative Example 1 (x1-x2=0) - while the first efficiency value is indeed slightly higher, this is at a lower charge capacity. Furthermore, capacity retention after 50 cycles is clearly lower in Comparative Example 2 than in Comparative Example 1 and in all examples labelled "inventive".

3.2.5 In the light of the above, it cannot be derived from the application as filed, as a direct and unambiguous disclosure, that Comparative Example 2 is meant to illustrate the disclosed invention. For this reason alone, it cannot provide a basis for further refining and limiting the definition of the invention.

3.3 Apart from the conclusion that Comparative Example 2 is not a suitable basis for amendment, extracting the x2 and x1-x2 values from it and inserting them in claim 1 amounts to an inadmissible intermediate generalisation.

3.3.1 The appellant did not contest that limiting the value of x2 meant that the full range of x1 was no longer available, but viewed this as a natural and implied consequence which did not establish a fresh relationship between parameters, and was irrelevant under Article 123(2) EPC.

3.3.2 The appellant also submitted that the significance of the parameters at issue (i.e. x2 and x2-x1) could be

derived from the application as filed, in which the respective general ranges were specified. These were entirely under the control of the skilled person. There was an explicit reference to adjusting the nickel content (paragraph [0031]). It was thus allowable to limit these ranges on the basis of a specifically disclosed value used in an example. The criterion established *inter alia* in T 201/83 (Reasons 12) for extracting a feature from an embodiment was met, namely that it was not so closely associated with the other features of the example as to determine the effect of that embodiment of the invention as a whole in a unique manner and to a significant degree.

3.3.3 However, unlike T 201/83, the x2 and x1-x2 values are in the present case closely associated with other features in Comparative Example 2. Comparative Example 2 relates to a specific overall composition (Ni:Co:Mn), a specific associated Ni content of the coarse particles and a specific rate of fine particles, which are all interrelated. Varying the ratio of fine particles while maintaining a given x2 value inevitably affects the overall composition and thus performance. Similarly, changing the Ni content of the coarse particles while maintaining a given x2 value also affects the overall composition and performance, and in particular directly changes the x1-x2 value. Redefining the limit for x2 in claim 1 - and in particular choosing the value of 0.80 as a new *lower* limit of x2 - has the effect of indirectly limiting the possible x1 values and the possible x1-x2 values, as reflected by omitting/changing the lower limit of x1 and the upper limit of x1-x2. The value of x2 thus may not be freely and independently varied, but rather imposes intermediate restrictions on the other features in the claim, which are not directly and unambiguously

derivable from the application as filed. For this reason too, the resulting subject-matter extends beyond the content of the application as filed.

3.4 In conclusion, the subject-matter of claim 1 in auxiliary request 1 does not meet the requirements of Article 123(2) EPC.

Auxiliary Request 2

4. Article 54 EPC

4.1 Claim 1 differs from the one in the main request in that it specifies that the particle 1 represented by Chemical Formula 1 has a size of 6 µm to 30 µm, and the particle 2 represented by Chemical Formula 2 has a size of 1 µm to 6 µm, and that the particle 2 is mixed in the ratio of 5 to 40 wt% with respect to a total weight of the cathode active material composition.

4.2 The above considerations regarding the main request (see point 2.1) apply here too. As outlined therein, the properties of the hydroxide precursor mixture may be equated with those in the final cathode active material composition. Consequently, the feature relating to particle sizes does not provide any additional delimitation from the corresponding particle sizes disclosed in Example 1 of D2 (i.e. 3.9 µm and 9.4 µm, respectively).

4.3 It is moreover known from D2 that the three powders are mixed in a 0.3:0.3:0.4 ratio, corresponding to a mixing ratio of 30% of the fine particles (particle 2, 3.9 µm).

4.4 The appellant submitted that the mixing ratio of the fine particles (particle 2) in percent by weight in the cathode active material composition could not be derived from D2. It was questionable whether the mixing ratio in the precursor applied to the final composition. During the oral proceedings before the board, the appellant argued that it was unknown if the indicated mixing ratio was based on percent by weight or, alternatively, by volume. They furthermore referred to Figure 1 in D2, relating to the final product, which in their view showed that the ratio of the fine particles was very high, while only a single large particle could be seen, and thus proved that the actual fine particle mixing ratio was much higher than 30 wt%.

4.5 These arguments are not convincing. D2 indeed does not specify the measuring unit but generally refers to a "mixing ratio". A volume ratio would not be the same as a weight ratio, as different particle size materials have different packing densities, which packing densities might furthermore depend on how exactly packing and measurement are done. However, this is the very reason why the skilled person would understand the ratio to be a weight ratio in the absence of any other indications. This understanding had not been doubted even by the appellant up until the oral proceedings (see the appellant's submission of 5 February 2025, page 18, second full paragraph). Moreover, it is confirmed by the resulting global composition of the final product specified in D2 (page 6, penultimate paragraph).

Moreover, in contrast with the appellant's view, the SEM micrograph in Figure 1 of D2 provides no suitable basis for deriving the fine particle mixing ratio. The appellant did not provide any calculation on the basis

of that figure. On the same subjective basis, i.e. without performing any calculation, the corresponding figure in the patent in suit (Figure 2) likewise shows a very high proportion of fine particles. The figure thus neither provides a reliable estimate of the weight ratio nor is it representative of the composition as a whole. This applies all the more to the SEM micrograph in Figure 2 of D2, which shows an even smaller excerpt (higher magnification).

4.6 In conclusion, the additional features in claim 1 of auxiliary request 2 do not delimit the claimed subject-matter from D2. Bearing in mind the considerations regarding the main request, the subject-matter of claim 1 is likewise not novel.

Auxiliary Request 3

5. Article 123(2) EPC

5.1 Claim 1 of auxiliary request 3 differs from the one in auxiliary request 2 in that the upper limit of the fine particle mixing ratio (particle 2) is 20 wt%

5.2 This amendment is again based on the examples in the application as filed, and additionally on paragraphs [0025] and [0026] which, however, relate to the results of the examples ("[a]ccording to an experimental example of the present invention" in paragraph [0025]).

5.3 The amendment parallels the one in auxiliary request 1 in that it is based on a value of a parameter extracted from the examples. However, in the case of the parameter under consideration here, i.e. the fine particle mixing ratio, the relevant value (20 wt%) was

contained in examples labelled "inventive" as well as in examples labelled "comparative".

5.4 The appellant maintained their arguments put forward with regard to auxiliary request 1 (see point 3.3.2). In addition, they submitted that the fine particle mixing ratio could be independently varied and controlled, and that this was even demonstrated in the series of Inventive Examples 1-3 in which the ratio was adjusted to 40%, 20% and 5%, respectively.

5.5 However, in the application as filed, a fine particle mixing ratio of 20 wt% was only disclosed in the context of specific embodiments in which it was linked, in particular, to a value x1-x2 of 5% (see Inventive Examples 2 and 5 in Table 3). This link is also clear from the corresponding parts of the description as filed (paragraphs [0025] and [0026]), in which the mixing ratio of 20% is mentioned specifically in relation to a value x1-x2 of 5%.

5.6 Following the same considerations as outlined in respect of auxiliary request 1 (see point 3.3.3 above), the specific overall composition (Ni:Co:Mn), the respective Ni contents of the fine and coarse particles, the difference in Ni content and the fine particle mixing ratio are all interrelated. Varying the ratio of fine particles inevitably affects the overall composition and thus performance. Moreover, as already indicated for auxiliary request 1 (see point 3.2.2 above), it is explicitly taught in the application as filed that when the Ni composition of the fine particles was equal to (i.e. x1-x2=0) or 10 mol% less than (i.e. x1-x2=0.10) that of the coarse particles, optimal capacity was not obtained, despite the ratio of fine particles being 20% (see paragraph [0025]), thus

discouraging combining a difference in Ni content of 10 mol% (x1-x2=0.10) with a fine particle mixing ratio of 20 wt% (as shown in the *comparative* examples, Table 3).

In claim 1, by contrast, a fine particle mixing ratio of 20 wt% is combined with broad ranges of the respective Ni contents of the fine and coarse particles (x2 and x1) and the difference in Ni content (x1-x2), including a difference in Ni content of 10% (i.e. x1-x2=0.10).

5.7 In the light of the above, the criterion established in T 201/83 (Reasons 12) for extracting a feature from an embodiment - on which the appellant also relied - is not met, in that the fine particle mixing ratio is in fact instead closely associated with the other features of the example, in particular the x1-x2 value, so as to determine the effect of that embodiment of the invention as a whole in a unique manner and to a significant degree.

It is therefore not decisive that the fine particle mixing ratio can be independently selected and controlled.

For the reasons indicated, extracting the fine particle mixing ratio from the examples and generalising it across the entire range of x1-x2 values in the claim constitutes an inadmissible intermediate generalisation.

5.8 The requirements of Article 123(2) EPC are not met.

Auxiliary requests 4, 5

6. Article 123(2) EPC

6.1 Claim 1 in auxiliary requests 4 and 5 contains, *inter alia*, the same ranges for the parameters x2 and x1-x2 as claim 1 of auxiliary request 1, in which the lower limit of x2 is 0.80 and the upper limit of x1-x2 is 0.10.

6.2 It was not contested that the considerations in this context were the same as for auxiliary request 1 (see point 3. above).

6.3 The requirements of Article 123(2) EPC are therefore not met, irrespective of the question of the consideration of these requests.

Auxiliary request 6

7. Article 123(2) EPC

7.1 Claim 1 in auxiliary request 6 contains the same range for the fine particle mixing ratio of 5 to 20 wt% as claim 1 in auxiliary request 3.

7.2 It was not contested that the considerations were the same as for auxiliary request 3 (see point 5. above).

7.3 The requirements of Article 123(2) EPC are therefore not met.

Auxiliary request 7

8. Article 123(2) EPC

8.1 Claim 1 in auxiliary request 7 contains, *inter alia*, a range of $0.05 \leq x1-x2 \leq 0.10$, in which the upper limit of $x1-x2=0.10$ is the same as in auxiliary request 1.

8.2 In the application as filed, this value of $x1-x2=0.10$ was only disclosed in the context of *comparative* examples, see Table 3, in particular Comparative Example 2. As outlined with regard to auxiliary request 1, and in contrast to the appellant's view, Comparative Example 2 does not merely constitute an embodiment of the invention which does not achieve the most preferred level of performance, but is truly comparative (see the remarks under points 3.2.2-3.2.5 above). In particular, as already indicated, it can be derived from paragraph [0025] that a value of $x1-x2=0.10$ does not lead to optimum capacity even if the fine particle mixing ratio is 20 wt%, i.e. even if the fine particle mixing ratio is optimised. Therefore neither this disclosure in paragraph [0025] nor the comparative examples to which it relates can provide a basis or a pointer for further refining or limiting the definition of the claimed invention, which would involve, *inter alia*, combining a value of $x1-x2$ of 0.10 with other - even less preferred - fine particle mixing ratios of 5 wt% or 40 wt%.

8.3 The requirements of Article 123(2) EPC are therefore not met.

Auxiliary requests 8 to 10

9. Article 123(2) EPC

9.1 Claim 1 in each of auxiliary requests 8 to 10 contains, *inter alia*, a range for the parameter x2 of $0.80 \leq x2 \leq 0.98$ and a range of $0.05 \leq x1-x2 \leq 0.10$, in which the lower limit of x2 of 0.80 and the upper limit of x1-x2 of 0.10 are thus the same as in auxiliary request 1.

9.2 It was not contested that the considerations applying to these features were the same as for auxiliary request 1 (see point 3. above).

9.3 The requirements of Article 123(2) EPC are therefore not met.

Auxiliary request 11

10. Article 56 EPC

10.1 Reference is made to the considerations regarding the novelty of auxiliary request 2 (see point 4.).

10.2 Claim 1 differs from claim 1 of auxiliary request 2 in that the respective particle size ranges of particles 1 and 2 are no longer specified (as in the main request), and in that the range for x1-x2 has been limited to the single value $x1-x2=0.05$.

As outlined for auxiliary request 2 with reference to the main request (see point 2.1), the composition known from D2 has a value of $x1-x2=0.045$. In the appellant's favour, it is assumed that the claimed value of

x1-x2=0.05 differs from the nickel content calculated for the composition of D2 of x1-x2=0.045.

10.3 According to the appellant, the technical problem had to be seen as that of providing an improved composition. The examples given in the patent in suit showed that this specific difference in nickel content (i.e. x1-x2 value) resulted in the compositions having advantageous properties, and in particular improved capacity retention. At x1-x2=0.05, the respective optimal temperatures of the fine and coarse particles were equal. This advantage was obtained over compositions having different x1-x2 values, including the composition known from D2.

The appellant was also of the view that the skilled person, starting from D2, had no motivation to vary the x1-x2 value to achieve said effect. An inventive step should therefore be acknowledged.

10.4 However, the claimed x1-x2 value is very close to that of the known composition (i.e. 0.045 in D2), and there is no indication that this marginal difference leads to any technical effect, such as the alleged improvement in capacity retention. While the experimental results in the patent in suit do show an improvement of the inventive examples over the comparative examples, they compare a difference in nickel content of x1-x2=0.05 with x1-x2=0 and x1-x2=0.10, respectively (Table 3). It cannot be concluded by extrapolation from these examples that an improvement would be obtained by the claimed value of x1-x2=0.05 over the known value of 0.045, irrespective of whether there actually is a clear boundary between these values, as has been assumed here (see above).

10.5 In the light of the above, the objective technical problem can merely be seen as that of providing an alternative.

10.6 However, a slight variation of the nickel contents around the specific example in D2, within the scope of claims 1 and 2 of D2, would be a routine measure for the skilled person wishing to provide an alternative.

10.7 The subject-matter of claim 1 therefore does not involve an inventive step.

Auxiliary request 12

11. Article 56 EPC

11.1 Claim 1 in auxiliary request 12 differs from claim 1 in auxiliary request 11 in that the range of the fine particle mixing ratio is 20 to 40 wt%. This feature does not provide any additional delimitation from D2, which relates to a fine particle mixing ratio of 30 wt%, as outlined in view of auxiliary request 2 (point 4.). Consequently, the same considerations apply as for auxiliary request 11.

11.2 The subject-matter of claim 1 therefore does not involve an inventive step in view of D2.

Auxiliary request 13

12. Article 13(2) RPBA

12.1 Auxiliary request 13 was newly filed with the appellant's submission of 5 February 2025, after

notification of the board's communication pursuant to Article 15(1) RPBA providing the board's preliminary opinion. This request consequently constitutes an amendment to the appellant's case and the provisions of Article 13(2) RPBA apply, according to which it shall, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons.

12.2 According to the appellant, this request was closely related to requests previously on file and assisted with procedural economy.

12.3 However, while reducing the number of requests is beneficial for procedural economy, the appellant did not demonstrate any exceptional circumstances that would justify the late filing of auxiliary request 13.

In particular, no exceptional circumstances can be seen in the fact that this request is closely related to auxiliary requests previously on file. It is a variation of auxiliary requests 11 and 12 and differs from the latter requests in that the fine particle mixing ratio is 5 to 20 wt%. Auxiliary requests 11 and 12 were newly filed with the statement of grounds of appeal (as the then auxiliary requests 35 and 36). While the question of the consideration of the then auxiliary requests 35 and 36 was left open in the board's preliminary opinion, and these requests were dealt with on substance (see also point 17.7 of the preliminary opinion, "irrespective of the question of their consideration"), this provides no justification for adding a further, similar request.

12.4 Furthermore, this request recites the range of "5 to 20 wt%" for the fine particle mixing ratio, which range

was found to infringe the requirements of Article 123(2) EPC in the context of auxiliary request 6, and it would, anyway, be questionable whether this objection is overcome. The appellant did not provide any arguments in this regard that were specific to auxiliary request 13.

12.5 There being no exceptional circumstances, auxiliary request 13 is not to be taken into account.

Auxiliary request 14

13. The patent proprietor being the sole appellant, the patent as amended in the form allowed by the opposition division cannot be challenged (G 9/92, headnote 1).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chair:

C. Vodz E. Bendl

Decision electronically authenticated