

Candidate's Answer – B (Chemistry)

Claims

1. A precipitated silica in the form of beads with a mean diameter which is less than or equal to 500 nm and a BET specific surface area of 250 to 350 m²/g, and wherein the beads have a DOP oil absorption ranging from 300 to 400 ml/100g.
2. A process for preparing beads of precipitated silica having a mean diameter which is less than or equal to 500 nm, involving reacting an aqueous solution of one or more silicates with an acidifying agent to produce a precipitated silica suspension, then separating and drying this silica, wherein the reaction is achieved as follows:
 - (i) an aqueous solution of one or more silicates containing the total amount of the silicate to be employed in the reaction is placed in a reactor, the silicate concentration in the reactor being less than 80 g/l expressed in g of SiO₂ per litre,
 - (ii) the acidifying agent is added to the said reactor until the reaction medium has a pH value which is:

greater than or equal to 5.0 and

equal to 7 or less;

and wherein the reaction time and temperature of the reaction medium are adjusted such that the silica beads obtained have a BET specific surface area of 250 to 350 m²/mg.
3. A rubber composition comprising a silica according to claim 1.
4. A tyre comprising a rubber composition according to claim 3.

EPO
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Dear Sirs,

We file herewith a response to the communication, along with amended claims.

Amendments

Claim 1 has been amended:

- (i) by the replacement of “50 to 500 m²/g” by “250 to 350” m²/g in respect of the BET specific surface area; and
- (ii) the addition of the feature that the beads “have a DOP oil absorption ranging from 300 to 400 ml/100g”.

These amendments are supported by page 3, lines 19 to 21 and page 4, lines 24 to 25 of the application as filed.

Claim 2 has been amended:

- (i) by the addition of the feature that the pH of the reaction medium is “greater than or equal to 5.0” (whilst retaining the upper limit of the pH of 7)
- (ii) by the addition of a feature that “the reaction time and temperature of the reaction medium are adjusted such that the silica beads obtained have a BET specific surface area of 250 to 350 m²/g”
- (iii) by the addition of a feature that the silica beads have a mean diameter which is less than or equal to 500 nm.

Amendments (i) and (ii) are supported by page 3, lines 19 to 21 and page 4, lines 23 to 25, in combination with the 1st paragraph on page 4.

Amendment (iii) is supported by page 2, lines 1 to 2 and previous claim 1.

Claims 3 and 4 are unamended.

Novelty

D1

Amended claim 1 is novel over D1, because D1 does not disclose precipitated silica beads wherein the beads have both

1. a BET value of 250 to 350 m²/g

AND

2. a DOP value of 300 to 400 ml/100g.

It is acknowledged that amended claim 1 defines the invention in terms of parameters. However, it is submitted that parameters in the claim are allowable because the conditions of Guidelines C-III, 4.7a are fulfilled (and T 94/82) - in particular, the parameters are well-established (see page 2, lines 2-3 and 13-15) and there is no other appropriate way of defining the invention, apart from perhaps a product-by-process claim, which we could have included, but which is also normally only suitable where other types of definition are not possible.

In particular, in the present case, the parameters allow the invention to be clearly distinguished from the prior art, thus there is no "disguised" novelty, as mentioned at Guidelines C-IV, 7.5, despite the fact that D1 does not disclose the DOP values of its silica preparations.

In particular, Example 1 of D1 corresponds precisely to Example 4 (ie S1 = P4) of the present application.

Example 2 of D1 corresponds precisely to Example 3 of the present application (S2 = P3).

Although S1/P4 has a BET value within the claimed range (280), its DOP value is outside the required range (420).

Although S2/P3 has a DOP value in the range of amended claim 1, (350), its BET value is outside the range (180).

→ Thus neither of the specific embodiments in D1 disclose independently all of the features of amended claim 1.

Note that features from separate embodiments cannot be arbitrarily combined.

Therefore, it is clear that the process of D1 does not inevitably result in a silica fulfilling all the features of claim 1 - D1 does not disclose using a pH of 5-7 in combination with selecting reaction times and temperatures such that a BET of 250-350 is obtained.

→ Claim 1 is novel over D1.

D2

It is submitted that amended claim 1 is novel over D2 because D2 does not disclose silica beads having BOTH

- (i) a BET of 250 to 350 m²/g

AND

- (ii) a DOP of 300 to 400 ml/100g.

Note that Example 2 of D2 has a DOP within the required range (350) but a BET outside the range (150).

Example 3 of D2 has a BET within the range (300) but a DOP outside the range (520).

Thus, there is no individual disclosure in D2 of beads fulfilling all the requirements of claim 1. The remarks above apply.

It is acknowledged that D2 discloses a BET range of 80 to 250 m²/g, which may be considered to overlap the range of amended claim 1, but D1 does not disclose this range in combination with a range for DOP. It is submitted that the use of the DOP parameter here is not a disguised lack of novelty, because the silica's of D2 clearly do not inevitably have a DOP value falling within claim 1. Moreover, D2 does not disclose any process for producing the silica particles - thus there is no inevitable result anticipation, and it may even be considered that the particles of D2 are not disclosed in an enabling manner such that a skilled person could produce them - in which case there can be no anticipation

Claim 2

Amended claim 2 is novel over D1 because D1 does not disclose a process wherein BOTH

- (i) reaction time and temperature are selected so that beads have a BET of 250 to 350 m²/g

AND

- (ii) the pH is 5 to 7.

Although it may be considered that S1/P4 fulfils the reaction time/temp criteria ((i)), the pH used is <5 (3.0).

Although it may be considered that D1 discloses a pH falling within the claimed range (by a specific disclosure of the end-point pH 7 is disclosing the range of 7 or less), there is no disclosure in D1 of this range in combination with the selection of the reaction time/temp feature.

→ amended claim 2 novel over D1.

Novelty over D2

As D2 does not disclose a process for producing silica beads, claim 2 is novel over D2.

Novelty of claims 3 and 4

Claims 3 and 4 are novel over D1 and D2 because the tyre and rubber composition comprises the novel silica of claim 1.

Inventive step

Claim 1

D1 may be considered to be the closest prior art document. Although D2 apparently seems to address a more closely-related technical problem, and it mentions silica beads, it does not describe how to make such beads. A skilled person would therefore make D1 a starting point, because D2 provides no technical teaching which allows a skilled person to make silica beads which might solve a technical problem.

The difference between claim 1 and D1 is that D1 does not disclose beads falling within both the parameter ranges of BET and DOP in claim 1.

The advantage conferred by this difference is that the properties of the beads are such that, when incorporated into rubber, the rubber properties are improved such that tyres made from such rubber have improved adherence to snow-covered ground. This advantage is clearly shown by Table III. Silicas P1 and P2, which fall within amended claim 1 are significantly superior to silicas P3 and P4, which are disclosed in D1 whilst retaining the other properties shown.

Thus the objective technical problem to be solved vis-à-vis D1 is to provide silica beads which allow the production of rubber tyres showing improved adherence to snow-covered ground (whilst retaining the other properties, wear resistance etc). D1 provides no suggestion that such properties can be obtained by using beads having the combination of parameters of claim 1. Even though it teaches the parameter range separately, it does not teach them as a combination. Moreover, the particular full worked examples of D1 do not suggest the importance of working in the pH range given in claim 2. Thus, even if a skilled person wanted to produce silica beads according to claim 1, he would not necessarily know how to do so, because D1 does not teach how this combination may be achieved.

Moreover, D2 does not provide a skilled person with any motivation to select the combined ranges of claim 1. Even though it attempts to solve the objective technical problem, it provides alternative solutions, and does not teach or suggest to a skilled person how to make the silica beads of claim 1, even if he wished to do so.

Claim 2

Effectively claim 2 is process specially adapted to produce the inventive product of claim 1, because it inevitably results in the silica beads of claim 1. Note that although the DOP parameter of claim 1 is not given in amended claim 2, the product resulting from process claim 2 will inevitably fulfil this feature, because selection of a BET of 250 to 350 m²/g inevitably results in a DOP of 300 to 400 ml/100g - see p 4, lines 23 to 25, when the pH is in the range claimed.

Therefore, claim 2 is inventive for the same reasons as claim 1 (because it is a process specially adapted for producing) and inevitably resulting in an inventive product, the process must also be inventive.

It is furthermore noted that neither D1 nor D2 teaches or suggests using a pH range of 5 to 7 in combination with a BET of 250 to 350.

Claims 3 and 4 are inventive because they comprise the inventive silica beads of claim 1.

Unity

It is submitted the claims are unitary because there is a single general inventive concept, involving the special technical feature of using/producing silica beads having the specific combination of DOP and BET values of claim 1, linking all the claims. Although the DOP value is not explicit in claim 2, it inevitably results.

Clarity/Conciseness

It is submitted that EPC Rule 29(2) is fulfilled because claims 1, 3 and 4 fulfil part (a) of that rule - they are a plurality of inter-related products, because the beads of claim 1 are present in all of them.

Summary

If the Examining Division intends to refuse the application, oral proceedings under A 116 EPC are requested.

Yours,
Patent Attorney

Note to Examiner

Claim 2 could have been worded:

“... wherein in step (ii) the reaction is allowed to progress for a time and at a temperature such that a silica having a BET of 250 to 350 m²/g is obtained, and then the reaction is stopped” (instead of final paragraph of amended claim 2). Basis is at page 4, 1st paragraph and 4th paragraph. Perhaps this would have been clearer than the wording chosen in amended claim 2. However, it seems that the claim given amounts to much the same thing. In particular, the DOP parameter could have been included in claim 2, but was not really necessary.

Product-by-process claim (instead of claim 1) could also have been used. There was clearly basis, but the absence of process features.