

Examination Report

Application No.

10201701302Y

Application filing date
17/02/2017

(Earliest) Priority Date

Examiner's Reference Number
IPOS/JT

1. This Examination Report is issued under Section 29(5) of the *Patents Act* with effect from 14/02/2014.

2. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability
- IV ☐ Unity of invention
- V ☒ Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Defects in the form or contents of the application
- VII ☒ Clarity, Clear and Complete Disclosure, and Support
- VIII ☐ Double patenting

3. The search report used was issued by the Intellectual Property Office of Singapore.

4. This report contains one or more unresolved objections.

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Date of Examination Report:
25/01/2019

Authorized Officer
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I. Basis of the report

1. This report has been drawn on the basis of:

- ☒ the **description**,
page(s) 1-10 as originally filed
- ☒ the **claim(s)**,
no. 1-14 filed with the response to the written opinion dated 04/06/2018
- ☒ and in consideration of the **response to the written opinion(s)**

2. ☐ This report has been established based on the exclusion of additional matter beyond the earlier application, as indicated in the supplemental box.

3. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental box.

4. Additional observations, if necessary:

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Supplemental box (Continuation of Box I)

In response to the second written opinion, the applicant has amended claim 1 to recite “wherein the cracking catalyst is an acidic porous solid material having a proton content in the range of 1 micromole to 1 mole per gram”. In addition, the applicant added new claims 8 and 14 and made further amendments to previous claims 8-10 (now claims 9 to 11).

It is noted that the applicant did not indicate any basis for the aforementioned amendments in their submission, and that some of the amendments/ added features made constitute added subject-matter. Specifically, there is neither clear nor unambiguous basis found in the specification as filed with regards to the following added features in the amended claims:

claim 1 – “to 1 mole per gram”;
claim 9 – “about 1.7 micromoles per gram”;
claim 11 – “solid tar”; and
claim 14 – “or lower and for a period ranging from 70-80 minutes”.

In particular, there is no support within the specification as filed demonstrating to the person skilled in the art there is clear justification to claiming the narrower range of “1 micromole to 1 mole per gram” as defined in claim 1.

As such, claim 1 constitutes added subject-matter and by virtue of dependence, claims 2-14 constitute added subject-matter.

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V. Reasoned statement with regard to novelty, inventive step or industrial applicability; Citation and explanation supporting such statement

Statement with regard to novelty, inventive step or industrial applicability

Novelty (N)	Claim(s)	1-14	YES
	Claim(s)	NONE	NO
Inventive Step (IS)	Claim(s)	NONE	YES
	Claim(s)	1-14	NO
Industrial applicability (IA)	Claim(s)	1-14	YES
	Claim(s)	NONE	NO

1. Citations

The following citations are referred to in this report. Full bibliographic details are provided in the Search Report:

- D1 – US 5079385 A
- D2 – MAJKA, T. M. ET AL., 2016
- D3 – NEVES, I. C. ET AL., 2006
- D4 – US 2009/0007484 A1
- D5 – JP H09-268293 A
(machine translation was used for the purpose of establishing the report)
- D6 – US 2551580 A

2. Novelty (Section 14 of the *Patents Act*) and Inventive Step (Section 15 of the *Patents Act*)

As discussed above, some of the amendments/ added features made in response to the second written opinion constitute added subject-matter (see Box I). In particular, the feature “to 1 mole per gram” is considered to constitute added subject-matter and is disregarded for the purpose of establishing this report (see Box No. I). The other added features as indicated in Box No. I are also not taken into account for the purpose of this report.

Claim 1

Claim 1 is therefore construed to read

“A polymer compound comprising:

50 to 99 percent by weight of a polymer; and

1 to 50 percent by weight of a cracking catalyst;

wherein the cracking catalyst is an acidic porous solid material having a proton content in the range of at least 1 micromole to 1 mole per gram

and wherein said cracking catalyst is directly compounded into said polymer compound.”

As a preliminary note, the expression “wherein said cracking catalyst is directly compounded into said polymer compound” is understood to merely mean that the cracking catalyst is directly added and combined with the polymer to form a polymer compound.

As the scope of claim 1 is narrowed by the amendments made, present claim 1 is also deemed novel for at least the reason as noted in the second written opinion. By virtue of dependence, claims 2-14 are novel.

I will now move to assess the inventive step of claim 1.

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V. Reasoned statement with regard to novelty, inventive step or industrial applicability; Citation and explanation supporting such statement

D1 is considered to be the closest prior art for the purpose of assessing inventive step (see citations as summarized in the second written opinion).

Looking at the applicant's submission, it is gathered that the applicant sought to differentiate the present application and D1 in several instances. In the interest of brevity, this report seeks to address the key differences discussed in the applicant's submission.

- With regards to "general background" difference (see paragraphs 4 and 5 of the applicant's submission), the applicant repeatedly emphasized that D1 is directed to a process of recycling plastics, particularly waste plastics, i.e. plastic products that have already been polymerized or formed into such products, however the present application is directed towards a polymer compound that may be treated as raw material ready for forming new useful plastic products such as bags, films, pipes and the like.

→ It is noted that as presently formulated, there is no limitation that the claimed polymer compound is directed only towards raw materials for forming consumable products. This is because as also noted in the first written opinion, the term "compound" recited in claim 1 in its ordinary meaning is construed as a thing that is composed of two or more separate elements, i.e. herein taken to be the same as a composition, a composite or a material.

- With regards to "polymer" difference (see paragraphs 5.2 and 5.3 of the applicant's submission), the applicant submitted that the recycled/recovered end products of D1 are predominantly benzene, toluene and xylenes rather than C₁-C₅ low-end hydrocarbon gases.

→ It is noted that in Example I of D1, the benzene, toluene and xylenes constitute in total only 11.7 wt % of the collected products and hence contrary to the applicant's submission, the benzene, toluene and xylenes do not comprise a major percentage of the recovered products. In addition, in Example II of D1 (see column 7, lines 28-30), it is indicated that the benzene being the solvent and carrier naturally forms the overwhelming component of the collected product and hence it does not necessarily mean that low-end gases are not produced from the process of D1.

- With regards to "catalyst" and "direct feed without added catalyst" differences (see paragraphs 6 and 7 of the applicant's submission), the applicant submitted that D1 does not disclose the zeolite catalyst present in the polymerized product to be recycled is present in sufficient quantity for cracking to take place.

→ It is admitted that D1 does not expressly disclose the amount of zeolite catalyst in the polymerized product (i.e. 1 to 50 percent by weight of a cracking catalyst).

- With regards to "specific proton content" difference (see paragraph 8 of the applicant's submission), the applicant submitted that the present claim 1 is now further limited to the proton content is between 1 micromole to 1 mole per gram.

→ As the feature "1 mole per gram" is considered to constitute added subject-matter, it is disregarded for the purpose of establishing this opinion (see Box No. I).

Accordingly, it is considered that the differences between D1 and the subject-matter of claim 1 lies in D1 does not expressly disclose

- (i) the amount of zeolite catalyst in the polymerized product/polymer compound and
- (ii) that the zeolite catalyst have a specific proton content of at least 1 micromole per gram.

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V. Reasoned statement with regard to novelty, inventive step or industrial applicability; Citation and explanation supporting such statement

It is considered that the aforementioned differentiating features (i) and (ii) appear to be interrelated and are collectively directed towards there must be sufficient amount of cracking catalyst and accordingly acid activity to catalyse the cracking process and hydrogen transfer reactions involved. As a result, they are assessed and discussed as one collective subject-matter.

D1 discloses a cracking process comprising contacting a polymer having been made by catalytic polymerization with a zeolite catalyst (i.e. hereafter referred to as polymerization catalyst) which remains with the polymerization product, with at least one acidic catalyst comprising **a zeolite provided at least in part by said polymerization catalyst** (see column 6, lines 10-37 and claim 2). In a specific circumstance, D1 teaches that “shaped articles made of zeolite (polymerization) catalyst containing polymers are directly feedable to the process of this invention without the necessity of adding more plastic cracking catalyst thereto” (see column 6, lines 28-31). D1 further discloses that to carry out the cracking process, the said zeolite catalyst is used in an amount of about 0.01 to 25 wt % and has an acid activity corresponding to an alpha of at least about 0.5 (see column 2, lines 12-14 and column 6, lines 55-59, and claim 14).

It can be readily appreciated from D1 that **the cracking process can be carried out without the necessity of adding more cracking catalyst** (see column 6, lines 28-31 and claim 2), **and under such a circumstance, the zeolite catalyst which remains with the polymerization product** (i.e. analogous to the polymer compound of the present application) **is apparently sufficiently present and has sufficient acid activity corresponding to an alpha of at least about 0.5 to catalyse the cracking process**. Taking into account that said acid activity is sufficient to catalyse the cracking process, it is likely that an alpha of at least about 0.5 would also correspond to a proton content of at least 1 micromole per gram (i.e. an amount also considered in the applicant's submission to ensure cracking process can be appropriately carried out).

As such, a skilled addressee would in view of the teachings of D1 find it obvious to arrive at a polymerization product with a zeolite polymerization/cracking catalyst in a sufficient amount and having an acid activity corresponding to an alpha of at least about 0.5 (i.e. analogous to a proton content of at least 1 micromole per gram), hence arriving at the subject-matter of claim 1 with a fair expectation of success. Therefore, an inventive step cannot be acknowledged for claim 1.

Claims 2-14

The inventive step objection for the subsequent claims is maintained based on the same rationale provided in the second written opinion. For ease of reference, the rationale is reiterated below:

The additional features defined in claims 2-14 are either already disclosed in D1 (see citations as summarized in the previous opinions), or are considered workshop variations/routine optimizations that are well within the purview of a skilled addressee which cannot confer any inventiveness. In particular,

Claims 2 and 3 – linear low density polyethylene, see D1, column 6, lines 24-25, and Examples I and II,

Claims 4 and 5 – workshop variation, see D1, column 3, lines 38-50; D1 teaches cracking catalyst comprises a mixture of zeolite and at least one non-zeolite acidic cracking catalyst (such as acid treated clay),

Claims 6 and 8 – workshop variation and routine optimization, see D6, column 3, lines 48-54; D6 teaches treatment of non-acidic clay (e.g. raw bentonite clay) with an acid chemical (e.g. dilute sulfuric acid) for use as cracking catalyst and see D1, column 6, lines 55-59; D1 teaches cracking catalyst is in about 0.01 to 25 %,

Claim 7 – routine optimization, see D1, column 3, lines 4-8 and column 4, lines 64-65; D1 teaches catalyst particle sizes can range from about 0.001 microns up to about ½ inch,

Claims 9 and 10 – film, see D1, column 6, lines 21-23, temperature used to form/extrude the film is workshop variation depending on the specific polymer used to form/extrude the film,

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Claims 11-14 – see D1, column 5, lines 1-6, Examples I and II and Tables 2-4.

Therefore, in the absence of any surprising technical advantage, an inventive step cannot be acknowledged for said claims.

3. Industrial Applicability (Section 16 of the *Patents Act*)

Claims 1-14 are industrially applicable.

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VII. Clarity, Clear and Complete Disclosure, and Support

The following observations on the clarity of the claim(s), on the question whether the disclosure is clear and complete, or on the question whether the claim(s) is (are) supported by the description, are made:

Clarity (Section 25(5)(b) of the *Patents Act*)

The applicant should kindly take note of the following with regards to claim 1:

- There appears to be a typographical error in claim 1, wherein the expression “wherein said cracking catalyst is directly compounded into said **polymer compound**” should be corrected to read “wherein said cracking catalyst is directly compounded into said **polymer**”.

Thank you for choosing our services.

For clarification of the Patent Examiner's comments in this report, direct communication may be arranged with the Patent Examiner via email. For the procedure to initiate such communication, please refer to the Patents Formalities Manual (please click [here](#)), under the heading **"Direct Communication with the Patent Examiner"**.

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Thank you.