

HÅMSØ PATENTBYRÅ AS
Postboks 171
4301 SANDNES

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Your ref.: P28496NO00
Application no.: 20180759 (please include in your reply)
Applicant: BERGEN CARBON SOLUTIONS AS
Due date: 2019.05.01

Office action in patent application no. 20180759

Basis of the opinion

Description received 2018.05.31
Claims received 2018.05.31
Drawings received 2018.05.31

Summary of the assessment

In our opinion, the invention disclosed in the application meets the criteria for patentability. If the formal deficiencies are corrected, the application may be approved for the grant of a patent.

Results of the novelty search

Reference is made to the following documents (D):

D1: CN 106379888 A
D2: US 2014/109933 A1
D3: WO 2005/085131 A2
D4: US 2014/183139 A1
D5: WO 2014/079505 A1
D6: CN 204018291U
D7: WO 2018/054121 A1

Assessment of patentability

The following is a reasoned statement with regard to novelty and inventive step, see Norwegian Patents Act, Section 2, first paragraph.

Novelty

Document D1, closest prior art document, reveals a purification system for improving purity of carbon nanotubes. The system has two compartments. In the first compartment, HCl is added and in the second, a filtering operation is performed with the aid of an ultrasonic unit, see figure and English translation.

The apparatus and method according to the independent claims, claim 1 and 4, differs from the closest cited prior art in that the apparatus and method in D1 does not utilise magnets to remove magnetic material. The subject matter of the claims are therefore novel.

Inventive step

In D1, an apparatus with two compartments is used to clean carbon nanotubes (CNT). The bottom part is a filtering vessel where the liquid containing the CNT is treated with ultrasound.

Whilst D2 refers to a cleaning bath for magnetic nanoparticles where ultrasound is used to remove impurities and magnets in the bottom part traps and stop magnetic particles from leaving the bath via the filtered outlet, see figures, paragraph [0013] - [0023] and claims.

D3 shows that CNTs can be separated according to magnetic properties with an inhomogeneous magnetic field. It is also revealed in D2 that magnetic material in the solution can be trapped in the side of the vessel by magnetic poles placed there, see figures and claims.

D4 reveals a vertical pipe-type separator for sorting carbon nanoparticles with two outlets. On one side of the pipe there is located a set of magnets generating a magnetic field. Nanomaterial, which contains magnetic material, is drawn towards the magnetic field and leaves the separator via the outlet closest to the magnets while non-magnetic nanomaterial leaves via another outlet, see figure.

In publication D5, an apparatus and method for treating solutions containing both magnetic material and carbon nanotubes is disclosed. The materials are treated with both ultrasound waves and a magnetic field. See figures and claims.

While document D6 describes a device for washing and separating solid-liquid magnetic nanoparticles consisting of multi-ultrasonic wave vibrator, a magnetic stirrer and liquid outlet in the bottom part, see figure.

Document D7 refers to an apparatus for removing magnetic foreign matter. The apparatus (10) has a feeding unit (12) provided allowing liquid material into casing (11). A magnetic module (13) absorbs the magnetic foreign matter in liquid material by magnetic force. A discharging unit (14) discharges liquid material from which magnetic foreign matter is removed from housing, see abstract.

In view of the cited prior art, the objective technical problem solved by the present invention is to provide an alternative apparatus and method for removing metal and other impurities from carbon nanomaterial.

The skilled person trying to solve a problem known from the prior art that magnets, ultrasound and filters are utilised when purifying/cleaning carbon nanomaterial. Magnets attract magnetic impurities and ultrasound will dislodge impurities and break up brittle ones. But none of the prior art documents teaches that a liquid containing carbon nanomaterial can be treated with ultrasound and a magnetic field whilst it is flowing through the purification apparatus. Therefore, it is not obvious for a person skilled in the art to arrive at an apparatus and a method according to the present set of claims from D1 alone or by combining the teachings of documents D1 with D2-D7.

The subject matter of claims 1-7 is seen to be associated with an inventive step.

Certain defects and observations

The apparatus according to independent claim 1 is missing an essential feature in that it does not disclose that magnetic impurities are to be removed, ref. Norwegian Patents Act, Section 8, subsection 2 first sentence.

The independent claims are not drafted in two-part form, which in the present case would be appropriate, ref. Patent Regulations, section 6, see also examination guidelines part C, Chap. III, item 2.2.3. Those features known from prior art should be placed in the preamble and the remaining features should be included in the characterising part of the claim.

The description is missing a disclosure of the closest prior art, see patent act section 8, subsection 2 and examination guidelines part C Chapt. II, item 3.2.1.

Instructions

For the application to be approved for grant of patent, the formal requirements of the description and claims must be met. We request that the application be made ready for final approval and that offset documents will be submitted.

When a patent claim is amended, the applicant shall state where in the application as filed support for the amendment is found, see Patent Regulations, Section 20. If an amended description is filed, the applicant shall specify which parts of the description are not in accordance with the previously filed description and specify in which way the amendments imply anything new in respect of the substantive content, see Patent Regulations, Section 21.

Provisional protection

Patent applications in English will be published 18 months after you first submitted your application (or from the priority date). In order to obtain provisional protection for your invention, you must submit a translation of the claims into Norwegian. The patent claims in Norwegian will form the basis for provisional protection during the application period. The provisional protection applies only insofar as the Norwegian and English texts correspond with each other. Provisional protection takes effect once you have supplied a translation of the claims and notice of this has been published in the Norwegian Official Patent Gazette (Norsk patenttidende).

Time limit for response

You are invited to submit a written response within the due date above. You may respond via [Altinn](#). If you fail to respond, the application will be shelved. However, the processing of the application may be resumed by paying a fee. Ref. Norwegian Patents Act, Section 15, third paragraph and Regulation Relating to Payments etc. to the Norwegian Industrial Property Office and the Board of Appeal for Industrial Property Rights (Regulation on fees), Section 26. You may request an extension of the due date, see «patentretningslinjene del A, kap. I, punkt 5.1» Examination Guidelines, part A, Chapter I, 5.1 (in Norwegian only). This must be done within the due date.

For general provisions regarding submitting of documents and payments, see Regulation on fees, Sections 1-6 and 8.

For your information

Relevant laws and regulations, as well as Examination Guidelines are available on our webpage, www.nipo.no.

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Please contact us if you have any questions

Sincerely,

Bente Aarum-Ulvås
Telephone: +47 22 38 75 23

Enclosures: cited publications, search report