

PATENT SPECIFICATION

(11) 1388 015

1388 015

- (21) Application No. 7950/72 (22) Filed 21 Feb. 1972
 (31) Convention Application No. 7105772 (32) Filed 19 Feb. 1971 in
 (33) France (FR)
 (44) Complete Specification published 19 March 1975
 (51) INT CL² C02C 5/10//C02B 9/02
 (52) Index at acceptance
 C1C 210 215 251 253 254 302 316 406 407 431 43Y



(54) PROCESS FOR THE BIOLOGICAL TREATMENT OF WASTE MATERIAL

(71) We, BANQUE POUR L'EXPANSION INDUSTRIELLE "BANEXI", of 1 Boulevard Haussmann, Paris 9^e me, France, a French Corporation, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention is concerned with a process for the biological treatment of waste materials in which nauseating or foul smelling fermentation is avoided.

Much research has been carried out into the treatment of pollutant industrial wastes, in particular hydrocarbon wastes. Various methods and compositions have been proposed for waste removal but all of these possess certain disadvantages. Thus, it has been proposed to use dispersing agents or emulsifying agents to deal with hydrocarbon wastes, but the use of these may lead to marked imbalance in the biological equilibrium of the particular environment treated. Further, it has been proposed to use weighting agents to precipitate hydrocarbons to the bottom of a body of water to produce agglomerates but these are only very slowly destroyed by the action of micro-organisms which may liberate substances which are toxic towards various flora and fauna.

In order to promote the biological degradation of waste materials and in order to minimise the disadvantages inherent in previously proposed compositions, the present invention provides a process for the biological treatment of waste material which comprises contacting the waste material with a composition comprising an absorbent mineral substance which is calcium carbonate, magnesium metasilicate, talc, natural silica or infusorial earth, and from 10 to 40 per cent by weight of an oxygenating agent which is a metal oxide and/or an alkali metal peroxide or perborate, and allowing the waste material to ferment.

The composition with which the waste material is contacted contains oxygen due to the presence of the metal oxide (for example,

iron oxide, manganese dioxide or zinc oxide) and/or peroxide or perborate. The presence of oxygen in the composition leads to aerobic fermentation which is generally more favourable for biological degradation and which is free from nauseating odours.

The oxygenating agents, i.e. the metal oxide and/or peroxide or perborate, is introduced into the composition by simply mixing it with the support or carrier, the nature of which will depend upon the pH of the waste material which it is desired to treat.

In the case of compositions for treating acidic waste materials, the support or carrier may be natural or precipitated calcium carbonate. For the treatment of basic waste materials, the support or carrier comprises an acid salt, i.e. the acid metasilicate of magnesium or talc. Finally, in the case of the treatment of neutral waste materials, or where for some reason or other, it is preferred not to alter the initial pH of the waste material, a neutral support is used, i.e. natural silica or infusorial earth.

In the treatment of hydrocarbon wastes, absorption may be promoted by the addition of some 5 to 15 per cent by weight of an oleophilic substance such as a fatty acid (e.g. stearic acid, palmitic acid, adipic acid or oleic acid).

Further, in order to promote the biological degradation process, the compositions may also contain from 10 to 30 per cent by weight of a microorganism nutrient substance which may contain both gross nutrients and trace elements. Examples of suitable nutrient substances include, for example, maize liquor, malting wastes or residues, or molasses.

Finally, in order to promote degradation when treating hydrocarbon wastes, the composition with which the waste material is contacted advantageously contains imino, amino, or ammonium nitrogen, i.e. nitrogen in the form (NH), NH₂ or NH₄). This nitrogen may be introduced into the composition, for example, by the addition to the composition of from 2 to 10% by weight of urea, ammo-

nium phosphate, ammonium nitrate, or ammonium sulphate.

The following compositions are given by way of example and are not intended to limit the invention.

- 5 Compositions for the treatment of acidic wastes
- (1) Natural calcium carbonate about 70 kg
Natural iron oxide about 30 kg
- 10 (2) Precipitated calcium carbonate about 80 kg
Zinc oxide about 20 kg
- (3) Precipitated calcium carbonate about 75 kg
Manganese dioxide about 25 kg
- 15 (4) Natural calcium carbonate about 80 kg
Sodium perborate about 20 kg

- Compositions for the treatment of basic wastes
- 20 (5) Talc about 75 kg
Sodium peroxide about 25 kg
- (6) Talc about 80 kg
Zinc oxide about 20 kg
- 25 (7) Talc about 75 kg
Manganese dioxide about 25 kg
- (8) Talc about 75 kg
Potassium peroxide about 25 kg

- Compositions for the treatment of neutral wastes
- 30 (9—16) The compositions obtained by replacing the calcium carbonate or talc in the compositions of Examples 1—8 by natural silica.

- 35 As stated above, all these compositions may also contain from 10 to 30% by weight of nutrient substances and/or, for the treatment of hydrocarbon wastes, from 5 to 15% by weight of an oleophilic substance.

- 40 The following examples illustrate the use of such compositions:—

Example A

- 45 50 litres of waste water from a paper mill were treated with 10 kilograms of the following mixture:—

	parts by weight
Talc	65
Manganese dioxide	25
Maize liquor	10

- 50 At the end of 30 days, the degradation of the waste in the water was complete without the development of any nauseating fermentation.

Example B

- 55 100 grams of crude petroleum floating on the surface of 10 litres of sea water in a

vessel were absorbed and precipitated by the addition of 100 grams of the following composition:

	parts by weight	
Precipitated calcium carbonate	60	60
Zinc oxide	15	
Malt extract	10	
Stearic acid	5	65
Ammonium phosphate	10	

After 10 days, there was no longer any hydrocarbon odour nor did any nauseating odour develop.

Example C

70 500 grams of light fuel oil spread over a cement floor were absorbed with 500 grams of the following mixture:—

	parts by weight	
Infusorial earth	50	75
Manganese dioxide	25	
Molasses	10	
Urea	5	
Stearic acid	10	80

The fuel oil was completely absorbed and the floor could be cleaned simply by sweeping. The fuel oil/composition mixture was taken up and poured into 20 litres of soft water. After 12 days there was no longer any fuel oil odour nor did any nauseating fermentation develop.

WHAT WE CLAIM IS:—

1. A process for the biological treatment of waste material which comprises contacting the waste material with a composition comprising an absorbent mineral substance which is calcium carbonate, magnesium metasilicate, talc, natural silica or infusorial earth, and from 10 to 40 per cent by weight of an oxygenating agent which is a metal oxide and/or an alkali metal peroxide or perborate and allowing the waste material to ferment.

2. A process according to claim 1 wherein the composition with which the waste material is contacted contains from 10 to 30 per cent by weight of a nutrient substance for promoting the growth of microorganisms.

3. A process according to claim 2, in which the nutrient substance in the composition is maize liquor, molasses, a melting waste or a malting residue.

4. A process according to any preceding claim wherein the composition with which the waste material is contacted contains from 2 to 10 per cent by weight of urea, ammonium

niun phosphate, ammonium nitrate, or ammonium sulphate.

The following compositions are given by way of example and are not intended to limit the invention.

- 5 Compositions for the treatment of acidic wastes
- (1) Natural calcium carbonate about 70 kg
Natural iron oxide about 30 kg
- 10 (2) Precipitated calcium carbonate about 80 kg
Zinc oxide about 20 kg
- (3) Precipitated calcium carbonate about 75 kg
Manganese dioxide about 25 kg
- 15 (4) Natural calcium carbonate about 80 kg
Sodium perborate about 20 kg

- 20 Compositions for the treatment of basic wastes
- (5) Talc about 75 kg
Sodium peroxide about 25 kg
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Zinc oxide about 20 kg
- 25 (7) Talc about 75 kg
Manganese dioxide about 25 kg
- (8) Talc about 75 kg
Potassium peroxide about 25 kg

- 30 Compositions for the treatment of neutral wastes
- (9—16) The compositions obtained by replacing the calcium carbonate or talc in the compositions of Examples 1—8 by natural silica.

- 35 As stated above, all these compositions may also contain from 10 to 30% by weight of nutrient substances and/or, for the treatment of hydrocarbon wastes, from 5 to 15% by weight of an oleophilic substance.

- 40 The following examples illustrate the use of such compositions:—

Example A

- 45 50 litres of waste water from a paper mill were treated with 10 kilograms of the following mixture:—

	parts by weight
Talc	65
Manganese dioxide	25
Maize liquor	10

- 50 At the end of 30 days, the degradation of the waste in the water was complete without the development of any nauseating fermentation.

Example B

- 55 100 grams of crude petroleum floating on the surface of 10 litres of sea water in a

vessel were absorbed and precipitated by the addition of 100 grams of the following composition:

	parts by weight	60
Precipitated calcium carbonate	60	
Zinc oxide	15	
Malt extract	10	
Stearic acid	5	65
Ammonium phosphate	10	

After 10 days, there was no longer any hydrocarbon odour nor did any nauseating odour develop.

Example C

70 500 grams of light fuel oil spread over a cement floor were absorbed with 500 grams of the following mixture:—

	parts by weight	75
Infusorial earth	50	
Manganese dioxide	25	
Molasses	10	
Urea	5	
Stearic acid	10	80

The fuel oil was completely absorbed and the floor could be cleaned simply by sweeping. The fuel oil/composition mixture was taken up and poured into 20 litres of soft water. After 12 days there was no longer any fuel oil odour nor did any nauseating fermentation develop.

WHAT WE CLAIM IS:—

1. A process for the biological treatment of waste material which comprises contacting the waste material with a composition comprising an absorbent mineral substance which is calcium carbonate, magnesium metasilicate, talc, natural silica or infusorial earth, and from 10 to 40 per cent by weight of an oxygenating agent which is a metal oxide and/or an alkali metal peroxide or perborate and allowing the waste material to ferment. 90

2. A process according to claim 1 wherein the composition with which the waste material is contacted contains from 10 to 30 per cent by weight of a nutrient substance for promoting the growth of microorganisms. 95

3. A process according to claim 2, in which the nutrient substance in the composition is maize liquor, molasses, a melting waste or a malting residue. 105

4. A process according to any preceding claim wherein the composition with which the waste material is contacted contains from 2 110 to 10 per cent by weight of urea, ammonium



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phosphate, ammonium nitrate or ammonium sulphate.

5. A process according to any preceding claim wherein the composition with which the waste material is contacted contains from 5 to 15 per cent by weight of a fatty acid.

6. A process according to claim 1 substantially as hereinbefore described in any one of the examples.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1975.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



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